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# REVIEW of EDUCATIONAL RESEARCH

Volume IV DECEMBER, 1934 Number 5

## PSYCHOLOGY AND METHODS IN THE HIGH SCHOOL AND COLLEGE

This issue revises and brings down to date the issues of the REVIEW OF EDUCATIONAL RESEARCH for December 1931 entitled *Psychology of the School Subjects* and for February 1932 entitled *Special Methods on High-School Level*. Related issues of the REVIEW include: *Educational Tests and Their Uses*, February 1933; *Psychology of Learning, General Methods of Teaching, and Supervision*, October 1933; and *The Curriculum*, April 1934. These previous issues of the REVIEW OF EDUCATIONAL RESEARCH are available by purchase from the Association. See outside back cover of this issue for rates.

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# REVIEW OF EDUCATIONAL RESEARCH

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**Volume IV** **December, 1934** **Number 5**


## Psychology and Methods in the High School and College

**(Literature reviewed from January, 1931, to January, 1934)**


Prepared by the Committee on Psychology and Methods in the High School and College: Harl R. Douglass, Carter V. Good, Charles W. Knudsen, Percival M. Symonds, and Walter S. Monroe, *Chairman;* with the cooperation of G. B. Affleck, E. G. Blackstone, Clara M. Brown, F. D. Cheydleur, S. C. Garrison, V. A. C. Henmon, Lester A. Kirkendall, J. Paul Leonard, Samuel Ralph Powers, Fred Strickler, and Mary T. Whitley.


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# FOREWORD

THIS number of the *Review of Educational Research* combines studies of methods and of the psychology of the various subjects of the high-school and at the college level. In the first cycle of topics, methods and psychology were treated in separate issues of the *Review*. It was found very difficult to separate these two topics. Many studies deal with both methods and psychology. The present treatment has proved to be much more successful. This number reviews a large mass of data on secondary and college subjects. In many instances the authors have been able to summarize the results as well as to indicate the subjects of the various investigations.

FRANK N. FREEMAN,
*Chairman of the Editorial Board.*

# INTRODUCTION

THE period covered by this summary of investigations relative to the psychology and methodology of school subjects at the high-school and college levels is that from January 1931, through December 1933, but, as will be noted, a few earlier studies are mentioned, and some of the authors have included a few researches reported or completed in 1934. In order to avoid undesirable overlapping with other fields, the authors were instructed not to include studies having to do with the construction of educational tests or their evaluation, the determination of objectives and other phases of curriculum construction, and the effect of size of class, homogeneous grouping, and other phases of school organization. However, the close relation between methodology and the content and organization of a subject makes it difficult to establish a definite boundary.

The authors were instructed to limit the studies reviewed to ones that would qualify as educational research. In general they appear to have attempted to comply with this request. The researches reviewed represent selections from a much larger number of studies. For example, the summary for English language, reading, and literature includes 111 studies out of 216 that were examined. In the field of the social studies, Knudsen reviews only 12 studies out of about 100 examined. In some cases, the bibliography includes a few references not mentioned in the review. Complete bibliographies would have been desirable as records of the period, but most readers will doubtless welcome the evaluation implied in the selections made by the various authors. The limitations of space also made detailed criticism impossible, but the reader will find many evaluative statements.

Any general statement relative to the quality of the research reviewed is hazardous, but as the chairman read the summaries, he was impressed by the fact that relatively few of the studies are explicitly commended. The implication of this observation is strengthened by the response received from a request addressed to the several authors asking that they mention studies that they considered outstanding in their own particular fields. Only five of the thirteen authors replied, and of the studies mentioned, only four were strongly commended. It is likely that a systematic evaluation of the 637 references listed would identify a much larger number as deserving of the label of "high merit." However, in view of the fact that only about half of the studies examined were judged worthy of mention, it appears that the average quality of the research in the field of the psychology and methodology of school subjects is not high.

If one seeks an explanation of this status, several causes are obvious. Small number of cases, lack of satisfactory measuring instruments, and uncertain dependability of findings are among the most obvious. The writer[1] has pointed out the difficulties encountered in the experimental evaluation of methods of teaching. In concluding the discussion, he suggested that a general evaluation may not be possible. Some of the evaluative statements in the following chapters tend to support this hypothesis. If a general evaluation of instructional procedures is not possible, attempts to secure evaluations in particular situations cannot be rated very high when considered as research contributing to a science of education. The low average rating of the research is contributed to also by the fact that a number of the studies deal with problems of minor importance or with ones that have already received extended attention. For example, in commenting on studies of language errors, Leonard pointed out that they are less valuable than studies of how children learn.

The following chapters will doubtless be read mainly for the information they present relative to the studies reviewed, but a person contemplating a study in this field will find it helpful to read them for the purpose of noting the evaluative statements and the suggestions relative to needed studies. Investigations having little merit as contributions to a science of education may be justified as service studies, but it is desirable that a larger number of competent persons devote their abilities and resources to the more important problems. Greater contributions could have been made during the three-year period reviewed if more of the workers had directed their attention to such problems.

WALTER S. MONROE, *Chairman,*
*Committee on Psychology and Methods*
*in the High School and College.*

[1]Monroe, Walter S. "Controlled Experimentation as a Means of Evaluating Methods of Teaching." *Review of Educational Research* 4:36-42; February, 1934.

# CHAPTER I

## English Language, Reading, and Literature

THE PURPOSE of this review is to summarize and to evaluate the most significant objective studies made in the fields of English language, reading, and literature on the secondary-school and college levels from June 1931 to January 1934. The titles used were chosen from an examination of 216 studies. Many studies were omitted, chiefly because they were considered of insufficient merit to warrant inclusion in this review or because they dealt with topics covered by other reviews in this series. Reports of several studies were omitted on account of the lack of data. Studies reviewed in other issues of the *Review of Educational Research* are not included.

### Summaries of English Studies

Since June 1931, several summaries of research studies in English have been made. The *Review of Educational Research* contained summaries in reading by Gray (28, 29), and in language by Lyman (65) and Leonard (59). These four sources briefly reviewed 203 studies in reading, literature, and English language. Pooley (81) reviewed 34 studies in English language and grammar pertaining to the organization of the curriculum. H. A. Greene (32) summarized the studies on contemporary usage. Gray (30) reported the studies in reading made from July 1, 1930 to June 30, 1931. Lyman (66) published a supplement to his earlier summary of studies in language, grammar, and composition. The most excellent summary made in the last three years is Lyman's interpretation and evaluation (64) of studies made in the fields of literature and reading. Gray's bibliography (27) of research studies in education has annotations for a few of the studies listed.

### Analysis of Trends

Trends in correlating English with other school subjects were studied by Mielenz (72); trends in the teaching of English for the subnormal child were presented by Musgrave (73); and trends in the many concepts of the learning and teaching of English by textbook writers were investigated by Duell (14). The most significant study of the trends in teaching English was made by D. V. Smith (95) for the National Survey of Secondary Education. Her study shows remarkable variance between the proposals of progressive leaders in the teaching of English and actual classroom practice.

### Investigations in Correct Usage

*College composition*—Several studies have been made to determine the abilities of college freshmen in composition. Ragsdale (85) analyzed

the mechanical errors in themes written by 1,300 freshmen in 5 teachers colleges in Illinois. Errors in punctuation were found to account for 46 percent of all errors made, while 15 simple types accounted for over 50 percent of the total errors made. Stalnaker (97), after trying to measure the ability of freshmen at the University of Chicago to write with clarity and accuracy, suggested that there were no means available, satisfactory to both research workers and college English teachers, for measuring such ability. Guiler (34, 35) studied the difficulties that 625 high-school graduates exhibited in applying 16 principles of pronoun usage and 20 principles of verb usage. He recommended much individual remedial instruction, as comparatively few principles offered difficulties for large groups of students. Pressey (82) and Arnold (2) discovered that the chief difficulties of the college students that they studied could be placed in a few types of errors, thus making them sufficiently limited in kind to make possible a well-organized attack upon them. Gunderson (40) studied 3,683 themes written by freshmen at the University of South Dakota over a period of three years. She found an average of approximately 14 errors per theme. All of these seven studies are similar; that is, they suggest freshmen needs from the counting of errors made on themes and on tests of the details of English mechanics. In general, the errors are listed in vague terms; the studies are subject to the faults of the ordinary loosely-made error studies; in some of them, an entirely undue emphasis is placed upon so-called errors of little consequence and upon the details of mechanics. It is doubtful if these studies make a real contribution to the larger problems of correct composition work in college.

*Grammar in high school*—Rodgers (89), Holtman (49), Pease (77), and Symonds and Hinton (100) studied the grammatical errors made by junior and senior high-school students. Rodgers (89), after analyzing compositions from 29,000 junior high-school pupils, reported that 82.9 percent of the errors occurred in only 24 types, that the pupils were making approximately 12 errors per 250 words, and that there was no correlation between grade or I. Q. (intelligence quotient) and the number of errors made. She was alarmed over the number of errors. Holtman (49) studied the pronoun errors made in 2,246 compositions by children in grades four, six, and eight in 20 schools in 7 states. She reported a decrease in errors from grade to grade; the attempted usage of all seven classes of pronouns in each grade; the indefinite use of "you" as the most frequent error; and the frequency of error for all classes of pronouns combined to range from 10.5 in grade four to 5.8 in grade eight. Pease (77) analyzed 480 papers for 158 kinds of errors. He discovered that clause and phrase control seemed to be better in the longer papers, and verb and pronoun use seemed to depend more on fluency than on grade. Symonds and Hinton (100) analyzed 724 compositions, calibrated to the Hillegas scale, to determine what learning takes place in the elimination of errors in grammar as one proceeds to compositions of

higher quality. They found that errors in grammar are not so numerous or so serious as errors in sentence structure or as errors in capitalization and punctuation. Confusion of the present and past tense consistently finds the first place in the errors for each grade, followed by wrong choice of preposition. Errors seem to be relatively constant in all grades studied. Grammar errors were found to be the least serious difficulties in the poorer compositions.

Analysis of the last three studies indicates that grammar errors are serious in terms of the author's definition of an error in grammar or in his conception of the grades in which the grammatical items should be taught. Rodgers (89), who was much concerned about the seriousness of grammar errors, listed the misuse of "shall" and "will" and the misuse of verbal contractions among the most frequent errors of junior high-school pupils. Holtman (49), concerned with all types of pronouns in grades four, six, and eight, listed the indefinite use of "you" as the most frequent error. It is hardly to be expected of children that they master verbal contractions and the use of all types of pronouns in grades eight and nine, and the accepted good usage of the interchange of "shall" and "will" and the indefinite "you" raises a question as to the seriousness of the "errors." Studies of language growth in terms of adolescent maturity and reasonable expectancy of achievement would be more valuable. The study by Symonds and Hinton (100) continues the series of excellent studies, under the direction of Symonds, on punctuation, capitalization, vocabulary, and sentence structure. These were previously reviewed by Leonard (59). As a group, they present a good picture of growth in writing throughout the high school. They would be more valuable if made on the growth of the same children throughout the high school rather than on the abilities of different children on different grade levels. In order to propose an organization of items of grammar for teaching in the high school and to suggest an experimental grade placement, Leonard (60) set up a cycle plan of grammatical items and allocated them by grade according to the results of research studies made on the selection of functional items and their grade placement.

*Punctuation in high school*—Goodman (25) and Gettys (24) studied growth in punctuation abilities. Gettys studied the punctuation errors made by children in grades four to eight, while Goodman studied the punctuation and capitalization errors made by children in grades five to eleven. Goodman (25) found the decrease in the average percent of errors made with all rules of capitalization and punctuation from grades five to eleven to be 51.8; in punctuation alone, 54.4. Gettys (24) discovered the decrease in the percent of errors from grades four to eight to be 34. Several rules of punctuation show as frequent errors in grade eight as in grade five; doubtless these rules have no validity in the teaching program of these early grades. Both studies were well organized and administered and give an interesting picture of the relative growth

in punctuation abilities as far as they are revealed by objective tests. Hamilton (43), using children in grade nine, and Cockrill (9), using children in grade seven, sought, by a technic of calculating error quotients of theme errors, to determine the control which pupils in these grades have over certain punctuation situations. In both grades, the period was used correctly more times than any other mark, and the semicolon ranked lowest for correct usage. These children showed tendencies to omit an item rather than to use it incorrectly and to substitute periods and commas for other punctuation. These studies confirm the findings of previous investigations, indicating that the period and comma carry the major burden of punctuation. After presenting their findings, the authors suggested a list of punctuation items to be presented in the two grades. Many studies have done this before, but each list has major variations. It is very doubtful if we can ever arrive at a satisfactory teaching program by basing our selection of items upon studies of the errors which children make. Ortmeyer (75), using tests with 516 pupils in grade eight, investigated the relationship between a knowledge of punctuation rules and correct usage of the rules. He found that a knowledge of the punctuation rule does not consistently carry over into the correct usage of that rule, nor does the correct usage of a punctuation mark indicate that there is a corresponding knowledge of the rule. The correlation between usage and the scores on tests of rules was .51. He concluded that the teaching of punctuation rules was not very effective. This is in keeping with the findings of other studies on the same problem.

*Language development of children*—One of the best studies made during the period covered by this review was LaBrant's analysis (57) of the language growth of 986 children from grades four to twelve inclusive and of 21 superior adults. She studied a total of 20,320 clauses in the composition writings of these individuals to determine the increasing tendency to use subordinate clauses, and its relationship to maturation. The clause was used as the unit of measurement, from which a subordination index was calculated. This index was the ratio of the number of dependent clauses used to the total number of predicates used. Her results showed a consistent increase in the percent of dependent clauses used. At the age of eight, the child uses 15 dependent predicates out of every 100 clauses; at the age of sixteen, he uses 35 dependent predicates to every 100 clauses. Although the degree of complexity increases with maturation, children learn without formal teaching to construct every type of complex sentence. The principles of grammar and punctuation demand more skill as pupils grow older; hence constant reteaching is required. The subordination index for children from grades four to nine was 28.0; for children from grades nine to twelve, 36.15; for superior adults, 45.9. It is interesting to note that the average length of the clause is comparatively constant between the ages of eight and sixteen, and that marked growth in language skills proceeds far beyond the level attained by high-school pupils.

Probably most interesting of all is the finding that the subordination index is markedly influenced by chronological age when mental age is constant. This raises many interesting questions concerning the influence of maturation on language development. This is a very valuable study carefully prepared. Together with the previous studies of Nice, Pal, M. E. Smith, McCarty, Piaget, and others, a worthwhile beginning has been made on the problem of how children learn to use language. Doubtless a still more valuable approach would be a careful case study of a group of children followed through the elementary- and secondary-school periods. Studies of the functioning of the child's mind as he creates speech and writing are far more valuable than continued error counts.

Remarkably similar results to those of LaBrant's study are found in the investigation of Frogner (22) who used 2,821 compositions written by 959 Minneapolis junior and senior high-school pupils. She found a decrease in the use of simple sentences from grades seven to eleven, and a corresponding increase in the use of sentences with dependent clauses. Like LaBrant (57), Frogner (22) found no positive relationship between intelligence and the use of sentences with dependent clauses. If, as these two studies suggest, "increase in the use of complex sentences seems to be a mark of increasing maturity from one grade level to the next rather than superior intelligence," we have a new concept which is basic to the organization of our teaching program. Loomis and Moran (62) studied the relationship between the proportion of different parts of speech in the writing vocabularies of individuals in grades seven and eight and their mental ability. They discovered that all parts of speech except articles and connectives have but little correlation with mental ability, and that the use of many verbs accompanies lower mental ability. Dolch (13) used sentence length as a measure of compositional ability of college freshmen.

**Investigations in Reading and Literature**

*Reading interests*—The White House Conference on Child Health and Protection (107) presented a study of children's reading. This report gives the chief findings of considerable research made on the reading interests of youth, an excellent bibliography, and good recommendations for supplying reading material to children. Cain and Brown (6) studied the outside reading interests of tenth- and twelfth-grade children in a New Jersey school. They found that about 57 percent of the books children read voluntarily could be ranked as "good or very good," that about 40 percent of the books have no particular merit, and that the rest could be classed as "harmful books." There is not enough increase in the pupils' abilities to choose good books independently as they progress through high school to justify the years of teaching which secured it. Johnson (52, 53) studied the reading interests of 1,856 boys and girls in comparison with the interests of adults. He found that girls read more books

than boys, but that boys read more newspapers and magazines than girls. Boys are more interested in adventure, girls in home and school life. The magazines most read by children are those published for adults. Children read more books and magazines than adults, and most of the reading of both groups is confined to fiction. Children secure about 37 percent of their reading from public libraries and use the libraries more than adults. Children indicated to the author that the recommendations of their friends influenced their reading more than the suggestions of their teachers. Perhaps teachers do not know enough adolescent literature. Witty (109) studied the reading interests of 503 women in Kansas City, Missouri. These women frequently read the newspapers, read little poetry, drama and biography, but preferred fiction and "middle grade" magazines. Williams' study (108) of the literary selections most interesting to 5,260 pupils in 50 South Dakota high schools adds information to the previous ones made by Jordan, Henderson, Wissler, Crow, and others.

*Reading and literary comprehension*—Crawford (12) prepared some excellent tests to study the comprehension of high-school pupils in twelve classics. She found no significant increase in comprehension, except on *Macbeth*, from grades nine to twelve. If her tests are valid, no growth in literary comprehension seems to be taking place in high school. She suggested a grade placement for several classics which accords fairly well with Burch's excellent study. Gresser (33) undertook to discover the types of literature most difficult to comprehend and to determine the factors that influence their comprehension. On the basis of involved statistical treatment of objective test results, she concluded that poetry was most difficult and fiction the easiest to comprehend. General intelligence, general information, and vocabulary ability seem to contribute much to the comprehension of literature, while a knowledge of grammar and speed in reading seem to influence comprehension little.

Holland (47) made an excellent study of a neglected factor in the field of high-school reading. By means of an analysis of photographic records of eye movements of 24 individuals, he tested experimentally the extent to which the length and structure of sentences affect the process involved in silent reading. He discovered that:

1. Sentences having restrictive clauses are read slower than sentences containing adjective phrases.
2. Sentences with conditional clauses at the beginning are read with greater speed by people above grade seven and at a slower speed by those below grade seven than are simple sentences.
3. Compound sentences are read as fast as simple sentences.
4. Complex sentences with non-restrictive clauses are read at about the same speed as simple sentences.
5. A long complex sentence with a series of participial phrases and the main clause at the end is read more slowly by all groups than is a simple sentence.

This study suggests a number of interesting problems for the student of

reading at the secondary-school level. It adds information to the findings of Judd, Buswell, Gray, Carroll, and others on the importance of the length and structure of sentences in the speed and comprehension of reading. One of our biggest problems in the teaching of literature is the determination of the comprehensibility of literary selections. We have never found a satisfactory way of determining this comprehensibility. Studies of vocabulary difficulties as a measure of comprehensibility have been highly disappointing; they should be replaced by studies such as Holland made, together with investigations on the relationship of comprehension to such things as types of sentences, abstractness of thought elements, and special arrangements of words and clauses in sentences.

*Literary appreciation*—Carroll (7) found that the relationship existing among the capacities to appreciate art, literature, and music is very slight. Leopold (61) found that poetic appreciation is a constant factor unaffected by education. She suggested that some pupils are quite impervious to esthetic training, that development of poetic appreciation must be secured by individual methods, but that having children write verse is not a satisfactory method of developing appreciation. Working on the basis of the findings of Broening, Abbott, and Trabue, and Logasa and McCoy, that appreciation can be measured both quantitatively and qualitatively, Ziegler (111) chose the following elements of appreciation for experimentation: (a) recognition of central theme, and (b) recognition of colorful vocabulary—meaning the recognition of words and expressions that give sensory impressions, apt or true comparisons, and vivid and suggestive expression. The author discovered growth in the two elements of literary appreciation studied, and found both to be measurable and susceptible to teaching.

*Factors affecting reading at the college level*—McNee (70) studied the relationship of certain educational and social factors to the reading achievement of 257 college freshmen at the University of Chicago. She found intelligence significantly correlated with reading achievement, and discovered that the students whose fathers were college graduates and who belonged to professional occupational groups showed superior reading achievement. Stockrahm's findings (99) and those of Broom (5) added nothing new to the study of the problem of reading. As other studies have done, they found great variation among freshmen in their reading ability and reading comprehension considerably influenced by intelligence and general information.

*Remedial reading in high school*—The planning of remedial reading programs and the measurement of their effectiveness are constantly recurring problems for study. McCallister and Baker (68) and Traxler (103) devised programs for corrective reading instruction in the seventh grade. Both found their plans of instruction to stimulate interest in reading and to cause improvement in reading abilities. Traxler (104) believes that junior high-school reading ability can be improved by teachers who are

not specialists in reading. He found a significant correlation between the speed with which individuals associate ideas with words and their rate of reading. He assumed that rate of association cannot be increased through specific practice, an assumption that probably needs further experimentation. Bennett (3) and Slemons (94) found reading drills to be somewhat effective in the general improvement of high-school reading ability. Hermans (45) believes that superior children improve their reading comprehension by being given opportunities to express themselves freely. McCarty (69) showed that special exercises on the use of magazines, newspapers, and literature improved pupils' reading comprehension, thus substantiating Gates' suggestion that these materials "are excellent for increasing general comprehension." Farbish (20) discovered that questions on paragraphs given to children to read were effective in increasing their reading comprehension. Jacobson (51) experimented with the effect on reading comprehension scores of ninth-grade pupils of sixty work-type reading exercises. The exercises proved to be more effective with poor initial readers than with good initial readers. His study seemed to give some weight to the contention that giving reading instruction in a field in which the content is to be mastered is superior to giving it in one subjectmatter field and expecting the ability to transfer to another field. About all that several of these remedial reading studies show is that carefully prepared assignments with proper teacher direction produce more learning than is derived from careless teaching.

*Remedial reading in college*—The problem of remedial reading in college is receiving increasing attention by experimental workers. Before 1930, only twenty-one studies had been made on the improvement of reading or study habits of college students. Eurich (19) made a careful and suggestive study to determine whether college students could improve their reading abilities under a rigid program of intensive drills in paragraph reading and vocabulary, which, in turn, would favorably affect their scholastic academic efficiency. He used as subjects freshmen at the University of Minnesota in four controlled experiments. No significant differences were found between the trained and untrained group in paragraph reading. Little difference was found in the results of vocabulary drill, there being no evidence of transfer to general vocabulary ability. There is not much comfort in this study for the one who believes in generalized learning. The author casts doubt on the value of direct teaching of reading in college and of "how to study" courses. Improvement seems to come from definite work in special fields. The investigation is conservatively done and points the way for further study of its general conclusion, namely, "that in the direction of specific drill, exercises may be found an instructional instrument superior to general instruction on the one hand, and to incidental learning on the other."

Using a series of special vocabulary drills with college freshmen, Eurich (18) found that students enlarged their vocabularies through

specific drills directed to that end. Gould (26) found small gain in reading ability, which affected grades only slightly, as a result of using Pressey's *Manual of Reading Exercises for Freshmen* with freshmen at the University of Wyoming. Parr (76) found that remedial reading exercises with college students at the University of Iowa improved their comprehension and their course marks. Gerberich and Cade (23) found the same at the University of Arkansas. Thompson (101) tried with success remedial exercises to improve freshman ability to read. Robinson (88) showed that a clinical treatment of reading difficulties aided college freshmen in the lowest tenth in reading abilities. Berry (4) showed that by including a remedial reading program in the freshman course in English, students could be improved in their abilities in visual imagery, in skimming, and in disregarding irrelevant materials. Zeleny (110) discovered that reading books, hearing lectures, and participating in discussion on psychology and the teaching of reading improved very little the reading ability of college freshmen. By a huge compilation of figures, H. P. Smith (96) arrived at the conclusion that college students may improve their reading rate 20 to 25 percent with accompanying gain in comprehension, by five minutes' practice a day for two or three weeks, provided this practice can be sufficiently motivated. E. B. Greene (31) studied the effectiveness of various rates of silent reading of college students on their ability to secure and to retain ideas. Little differences existed between those who read fast and those who read slowly. Those who took notes forgot as much as those who did not, but those who were required to answer test questions by direct comparison with the topic studied had better retention. Interest and effort varied inversely with the complexity of the material. Holmes (48), working with 86 college students, found that people whose reading was guided by questions significantly surpassed those who read and reread carefully without the use of questions.

**Investigations in Methods of Teaching**

*High-school literature*—In a well-controlled experiment, Stickle (98) evaluated the relative effectiveness of the synthetic (extensive) and analytic (intensive) methods of teaching. She found that literary appreciation was affected more by the method of teaching than was comprehension, that the synthetic method improved appreciation, and that comprehension to some extent affects appreciation. These findings agree with those of Hosic, Coryell, and Williams on intensive versus the extensive study of literature. Contrary to Irion, who found poetry more difficult to comprehend than prose, Stickle (98) found her 318 eighth-grade pupils to do as well on poetry as on prose.

*High-school composition*—Tormey (102) found that class instruction in grammar and punctuation in the tenth grade was fully as effective and probably more effective than individual instruction. This finding both agrees and disagrees with other studies on the same problem. Looseness

of methods and inadequacy of controls make most of these studies unconvincing. Qualley (84), with limitations to his study which make his findings questionable, reported that when punctuation rules have been learned with one or two illustrations, they carry over into usage. This finding is not in agreement with most of the studies on this problem, except for bright children. Perryman (79), in a well-controlled experiment, showed that subnormal children in grade ten gained no adequate concept of case, number, and tense, or gave any evidence of having made application of these concepts in choosing correct forms. Improvement in subnormal groups came through repetition of forms, not through concepts. Warner (106) studied the relative merits of individual and group instruction in grammatical usage with ninth- and tenth-grade pupils. Individual instruction based on individual diagnosis was found to be much more effective than mass instruction in the remediation of shortcomings in grammatical usage. Improvement is directly related to intelligence. Gunn (41) showed that skills in correctness, reading, and vocabulary could be improved in the ninth grade by the administration throughout the school year of a series of drill exercises. McAdow (67) compared the relative effectiveness of teaching grammar by a study of the structure of the sentence and its elements as an organized body of facts against the method of limiting the study to principles which the student seeks to know to improve the correctness of his own discourse. Her conclusions that we ought to have more grammar drills and that there were discovered little differences in the results of the two methods are not warranted because of the nature of her investigation. This study attacks one of the major issues at the heart of the new movement in the teaching of English, and well-controlled studies need to be made on it; but one cannot make a satisfactory study by teaching "conventionally" and "incidentally" and then by measuring the outcomes conventionally. One can hardly expect a group taught incidentally to pass a test on naming "English essentials" as well as a group drilled in naming them. It is significant to notice that even under this testing, the group McAdow taught "incidentally" learned as much grammar as the group taught "conventionally." We have never decided upon the purposes grammar is designed to serve, nor have we devised tests to measure the extent to which grammar has improved the language as an instrument of thinking. Both must be done before we can advance far in the settlement of the place of grammar. Shockey (91) found that systematic guidance in writing and organizing compositions followed by pupils' self-appraisal was more effective in eliminating mechanical errors and equally effective in improving general composition merit with all levels of ability of children in the eleventh grade. The composition method was superior to the grammar method with poorer pupils. Drill in grammatical forms and the intensive study of typical errors had slight value in the elimination of specific errors in the written expression of pupils.

Fellows (21) investigated the influence of theme correction on the elimination of technical errors in the written compositions of ninth-grade children. He found theme correcting to have some value in eliminating grammar and punctuation errors, being better for bright than for dull children, but that in general it was only slightly better than good teaching without theme correcting. If this be true, the teacher may well turn her attention to teaching and dispense with the midnight oil required for theme correcting. Lyman (63) and Hall (42) studied the values of having pupils correct their own themes before handing them to the teacher. Lyman (63) set up a work pattern by which a child can be taught to plan and correct successfully his own compositions. The pupils planned, wrote the first draft, appraised, revised, and copied their compositions. By following this plan they learned to write better compositions and to correct about three-fifths of their own errors. Hall (42) substantiates this evidence by showing that pupil-appraisal promoted greater progress in general composition ability and language usage than did teacher-appraisal. Such studies mean we can do away with much useless composition marking by English teachers. Lee (58) added further evidence to this idea by showing that her experimental groups could learn quickly to plan their own compositions and could correct about three-fourths of their own errors without teacher help. A year's growth in composition was recorded in about fifteen weeks.

Perkins (78) experimented with the use of an elaborate study guide to assist high-school and college students to write better compositions. She found no valid objective results in favor of the use of the guide, but by questioning certain students, she discovered that they favored the use of the study guide. Ransom (86) demonstrated that diagnosis and remedial work can be given effectively to a class as a whole instead of to each individual, and that such a method will produce large gains in composition accuracy. In a highly subjective study, Robacker (87) sought to raise certain questions regarding the status of creative writing in our schools. Eaglesham (15) discovered that as a method of revision and study preparing a lesson by an oral composition plan—speaking and asking questions among pupils—was a superior method of working. Such practice should in turn improve composition ability and should be a tool for the study of all subjects—one of the major functions of English. Coleman (10) sought to discover the topics which pupils preferred to use for composition subjects and to learn which types of written discourse are preferred by pupils from the seventh grade through the twelfth grade. He found that the majority of boys and girls prefer the friendly letter, argument, description, and narration, in the order named. He suggested that composition assignments be on the child's level of interest and comprehension, and that the teacher give the child considerable free choice in the selection of his own topic. Plasman (80) studied the comparative disciplinary values of oral and written composition.

In teaching children to organize their ideas and use correct form, she found that oral composition was better than written for teaching children mastery of grammatical form and the organization of ideas in suitable relation, but that written composition was superior to oral for teaching sentence structure. Her study, however, is not convincing.

*Methods of teaching college composition*—Increasing attention is being given to the study of the difficulties in English expression experienced by college freshmen and of the organization of the freshman English course to meet the demands of students at this level. Experimental investigations are being made at a large number of colleges, reports coming from such institutions as the University of Oregon, Ohio State University, University of Iowa, Miami University, University of Chicago, Syracuse University, and others. At Syracuse University, Johnson and Hartley (55) are directing an inquiry, under a grant from the Carnegie Foundation for the Advancement of Teaching, into the methods, purposes, and effectiveness of the training of college freshmen in written composition. This large investigation is to consist of a number of experimental studies to measure the efficacy of certain methods of teaching freshman composition. The investigation has only begun, and reports from it should be watched for the information they throw on this problem of freshman composition teaching. Johnson's preliminary report (54) of the experimental hypotheses will orient one to the problems under study. At the University of Oregon, Shumaker and Leighton (92) have been interested in developing examinations to measure freshman deficiencies in English, diagnostic procedures and methods to treat individual cases, and workbooks for class instruction in remedial English. They reported functional English tests with an average reliability of .94, which predicted the grade actually earned in the University of Oregon in 90 percent of the cases, and have devised workbooks which have given reasonable satisfaction. At Ohio State University, Price (83) reported success with the conference system of remedial instruction. He believes such remedial work can be done better during the last two college years than immediately after the freshman course. At Miami University, Guiler (36, 37, 38, 39) administered to freshmen diagnostic tests in capitalization, punctuation, sentence structure, spelling, and grammatical usages. To students showing deficiencies in these phases of English, he applied remedial instruction in the form of workbooks and drill exercises. When the results of these experimental groups were compared with the work of non-remedial groups, he found that the remedial groups had improved much and had retained the improvement. He strongly recommended individual diagnosis and remedial work. Conkling (11) reported success in the elimination of mechanical errors by the use of drill exercises with college freshmen.

From these and other reports of experimental work in English with college freshmen, it may appear that we should be able to reorganize our freshman English courses. It is discouraging, however, to see so many

of the studies concerned with the thing that has been done so long in high school, namely, the administration of tests for mechanical errors and teaching to correct the errors discovered. This seems to overemphasize mechanical details and to underemphasize the development of clear and effective expression. When we can resolve the difficulty between the relative importance of weighting mechanical errors and thought content in tests, we can probably make more advance in our teaching organization. Research students have probably placed too much emphasis upon objective measurement of the mechanics of expression, while members of college English departments have too much faith in the validity of unreliable theme judgment.

Meyland (71) investigated the effect of theme titles on the inventive and imaginative elements of themes written by college students. Colvin and Meyers years ago studied this problem with children. Meyland's results sustained the findings of these earlier studies, namely, that theme titles influence but do not teach the use of inventive and imaginative elements of pupils' writings. Here is a wide open field for research, not only for determining with all levels of maturity the varying effects of theme titles upon expression, but determining the ages at which these imaginative powers can best be stimulated. The technics for studying this problem must be refined.

*Miscellaneous studies*—In searching for studies in the field of English, a number of researches were examined that do not deal directly with psychology or methodology. Two appear to deserve mention, the first because of its suggestiveness for further studies, and the second because of its scholarly qualities. Ching (8) studied the relative relationship of certain English curriculums at the high-school level to success in the first year of college English. Simon (93) made a thorough and scholarly survey of the reading of Shakespeare in American secondary schools and colleges from the early beginnings of these schools to the present.

# CHAPTER II

## Social Studies

KIMMEL (119) reviewed controlled experimentation in methods of teaching the social studies, stating that all but two of the experiments reviewed represented work done in master's theses. The present summary contains no reviews of master's theses for the reason that it was impossible under existing conditions to obtain for review copies of all theses which dealt with controlled experimentation in the social studies. The present summary is, therefore, restricted to such doctoral dissertations as could be obtained for review, and to the more significant printed reports of experimentation. Descriptive accounts of uncontrolled experiments have not been included.

Simpson (121) studied the effect of training in organization on ability to read historical materials. No attempt was made to equate the experimental and control groups at the beginning. Classes including a total of 1,074 pupils in 7 schools were used for the experiment. Results were based on the scores made by 606 pupils on a general United States history test, a "composite history test," and the Van Wagenen Reading Scales in History, Form B. Tests constructed by the experimenter for measuring gains in achievement were not well validated, but their reliability was shown to be high enough for use in making group comparisons. The findings were inconclusive and conservatively reported.

Kelley (118) compared the "traditional" method of teaching history in the ninth and eleventh grades with a "socialized-activities-project" method, using experimental and control groups of 25 each in the ninth grade and of 22 each in the eleventh grade. Groups were carefully equated on bases of sex, age, home environment, intelligence, absence from school, out-of-school work, curriculum pursued, time, teacher preparation, and instructors' attitudes. The tests used to measure gains were in most instances constructed by the experimenter with no effort to study reliability and with little evidence of any attempt to validate them. The smallness of the groups and the inadequate statistical treatment of the data render the study practically valueless from a scientific standpoint, and the broad generalizations given in the study are almost wholly unsupported by the evidence. The report is to be commended for its clarity.

Barton (112) investigated the effect of outlining as a study procedure in ancient history, American history, and geography in the junior high school by the equivalent group method. The investigation included 5 experimental groups with a total of 94 pupils and of 5 control groups with a total of 94 pupils. The groups were equated on the bases of mental ability, achievement in ancient history as measured by the Sackett Scale in Ancient History, in geography by the Stevenson, Ridgely, Shipman

Geography Test—South America, and in American history by the Pressey-Richards Understanding of American History Test. The effects of outlining were measured by tests constructed by the investigator. No data on validity or reliability of these tests are given. The author's conclusion that "allowing for a possible radical error in measurement due to whatever degrees of unreliability characterize the tests, it still seems reasonable to conclude that outlining is both an economical and efficient study device," represents a broader generalization than the data warrant. This, too, is a clearly written report.

Crawford and Slagle (115) reported a series of controlled experiments in comparing the laboratory method with a more formal recitation method in teaching economics, history, and citizenship in the ninth, eleventh, and twelfth grades. A rotation procedure was followed. Smallness of groups compared (in no case over 28) and the fact that the objective tests used to measure results were of undetermined validity and reliability make highly questionable the conclusion that the laboratory method was superior. A number of interesting comments by the investigators relative to the advantages and disadvantages of the laboratory method no doubt have significance, but they are not supported by the data reported.

Freeble (116) compared the contract plan and the use of a study guide in teaching modern European history. Previous grades in history, scores on the Terman Test of Mental Ability, and the Van Wagenen Reading Scales were used to equate the two classes used in the experiment. Teacher-constructed objective tests were used to determine relative gains in achievement. Rather careful statistical interpretation of the significance of differences in mean gains in the absence of adequate measures of these gains and in the absence of reliable samples did not suffice to warrant the experimenter's conclusion that the study-guide method was superior to the control plan.

Crawford and Walker (114) compared the "backward-forward" method of teaching two units in history (one for six weeks on transportation, and one for six weeks on communication), with the "forward-backward" method. Although the results of teacher-constructed objective tests favored the method which began with the present and worked backward, the findings, as the writers state, are merely suggestive.

Mayberry (120) attempted to answer the question: Does participation in student government by high-school students aid in the formation of habits of citizenship? Two groups of 39 pupils, one consisting of members of the student council, and one of 39 pupils who were not members, were paired on bases of sex, grade level, social-economic status as estimated by the Sims Score Card, and mental age. Unaware that they were being compared, the two groups were rated by use of the Chassel-Upton Citizenship Scales, Forms G and H. Careful statistical interpretation of the difference between average gains in ratings apparently demonstrated that the answer to the question raised was in the affirmative. It

is proper to raise a question about the experimental factor in this case. Is the cause of the improvement in scores due to the fact of participation in student government, or is it due to some factor that was operative in determining membership on the student council in the first place?

Wrinkle (123) compared the whole method in teaching social science with the part method, using two classes of 18 pupils each. The tests for measuring gains in achievement were inadequate since little attention was given either to a determination of their validity or reliability. The groups used in the experiment were small. Inadequate attention was given to the matter of determining the significance of the difference between average gains in achievement. Conclusions based on the findings of this study are therefore hazardous.

Tormey (122) investigated the effect of drill upon specific and general comprehension of historical content in the seventh grade. Two experiments were conducted under classroom conditions. The first experiment included 200 pupils in four equated groups; the second, 164 pupils in four equated groups. In each experiment one group was used for a control and three for application of the experimental factor. Groups were carefully equated on the basis of scores on a specially constructed test which was carefully validated and whose reliability was determined (.784). Drill material was prepared and its use with the experimental groups constituted the experimental factor. Adequate statistical interpretation of differences between average gains in achievement revealed a significant advantage for the experimental method. This careful experiment is important, not because of the conclusion that drill upon key and geographical words and collocations results in improvement in the specific comprehension of such words and collocations (something that seems to be rather obvious), but rather for the fact that the gain is as significant as the experimenter has demonstrated it to be.

Bennett (113) studied the effectiveness of the written preview in teaching history in the secondary school. His investigation included six separate experiments in six different high schools. In each experiment, the use of the written preview was taken as the experimental factor. Groups were equated on the basis of the scores made on the Otis Self-Administering Test of Mental Ability, Higher Form B. Gains in achievement were estimated by scores made on a teacher-constructed objective test of undetermined validity and reliability. Use was made of the "critical ratio" to determine the significance of the differences in gains. Bennett stated that his results are inconclusive and expressed the judgment that the experimental method did not appear to justify the extra time it required.

French (117) studied the effect of specific training in vocabulary, the reading of maps, graphs, and tables, and organization on achievement in 7-B history, using 778 pupils in four junior high schools. He used the equivalent group method of experimentation over a period of nine weeks which was divided into three periods of instruction of three weeks each.

Groups were equated on the basis of scores made in the Otis Self-Administering Test of Mental Ability, Form B, and the Wiedefeld-Walther Geography Test, Form A. This equating procedure was checked by "re-equating 104 pairs of pupils on a three-element basis which included a test of general reading ability. Standard scores on the Sangren-Woody Reading Test, Form A, were averaged with the standard scores on the original equating tests to secure the three-element composite scores." Gains on specially constructed unit achievement tests were taken as measures of gains in achievement. These results were checked against results obtained by readministering the aforementioned geography test.

Mean gains on the unit tests were in every instance higher for the experimental groups, and the difference between mean gains of control and experimental groups were statistically reliable. The writer conservatively states that under the conditions of the experiment, the experimental method is superior to the control method. A possibly valid criticism of this careful study relates to the nature of the experimental factor. It may be true that the experimental method involved procedures (e.g., use of practice exercises in reading), that amounted principally to coaching on the type of test used to measure achievement.

# CHAPTER III

## Foreign Languages

A REVIEW of the literature on the foreign language methodology and psychology, to which this report is restricted, offers such a mass and maze of data that it is impossible in the allotted space to do more than touch upon major contributions. The bibliography of Buchanan and McPhee (140) summarized the significant literature on foreign language teaching up to 1927. That of Coleman (149) covers the years 1927-32. The most notable difference between these two bibliographies lies in the stress on experimentation and research in the latter. The recent survey of investigations by Bond (135), while not attempting a critical analysis, does emphasize the marked change in technic of approach that has occurred during the last decade. Other references (147, 161, 251, 252, 253) contain comprehensive bibliographies and related information.

### Trends Abroad

Perhaps the best single study on the training of teachers and methods of two leading European countries is that by McMurry, Mueller, and Alexander (206). Whatever fear may be entertained in some quarters in the United States for the fate of the direct method in its various forms, ought to be allayed in some degree by the example of Germany and France, where this method appears to be holding forth as vigorously as ever. To be sure, there are a few scholars who show that they are not wholly satisfied; for instance, Runschke (234) pointed out to the teaching profession, textbook makers, and publishers in Germany the advantages of word and idiom counts. In France, Roger (233) revealed a discontent with the status quo and offered a partial solution by the use of frequency counts in vocabulary, just as Duthil (156) did earlier in regard to the *French Idiom List.* An examination of methodology in England reveals a situation comparable to that in the other two countries, as can be seen from the modern language program outlined by Collins (151), who stressed the time-honored principles of oral, aural, and written work, drill on grammar and syntax, and the acquisition of cultural background, all of which have the earmarks of the modified, direct, or eclectic method. However, we can detect the beginning of a new experimental direction on the part of English teachers and publishers through the scientific investigation and vocabularies in beginning French courses by Milton and Benn (209) and by recent English textbooks (128). After examining many English, French, and German periodicals bearing on the subject, the present reviewers agree with Benn (130), who writes:

> The fact is that in the field of modern language teaching, research (as in some other fields which the Americans have made their own) in the U.S.A. and Canada

is many years ahead of us. They have now on their side resources, scholarship, trained workers, and a developed technique.

Similarly Jacka (189) who, after calling attention to the paucity of recent works of a research nature on linguistics in English libraries, made the following comment:

> This state of affairs not only illustrates, but to some extent explains, the considerable lag of language teaching method behind scientific knowledge, experimental psychology, and pedagogy, as well as linguistics.

A notable exception to this following of the beaten path abroad is seen in the remarkable publications of the Institute for Research in English Teaching, Department of Education, Tokyo, Japan (221).

### Syllabi

A survey of about a score of syllabi, including one English and one Scottish, and a wide sampling of our own states, yields very little that can lay claim to originality. When boiled down, nearly all these syllabi reveal the same traditional stress on reading, writing, hearing, speaking, and cultural background with variations in emphasis, approach, and time spent on these objectives. A critical review by Benn (131) of three modern language syllabi, representing England and the United States, sustained this point. Of the dozen and a half of the latest syllabi of the states examined, including the one for New York City, ten demonstrate an awareness of the value of recent language investigations; some by recommending standardized tests; others, word and idiom counts; and still others, the reading method. Examples of syllabi taking cognizance in some way or other of recent language research, are those for New York State (216), revised 1933, New York City (215), Connecticut (153), Texas (244), North Dakota (217), New Hampshire (214), Pennsylvania (225), Minnesota (210), and the College Entrance Examination Board (240).

### Vocabulary and Idiom Studies

The last three years have seen the greatest activity either in making new vocabulary and idiom counts or in attempts to revamp those already established. Coleman (149) devoted his attention to over 40 such frequency counts, including analyses and special studies. Henmon and Stagner (181) pointed out the practical importance of such counts applied to the problem of reading a foreign language, setting forth the results of over a dozen studies. Coleman (150) also emphasized this point. The most valuable of the recent frequency lists, dealing with vocabularies and idioms, are Keniston's list (195) of Spanish words and idioms, Purin's list (229) of German words and idioms, the list of French words and idioms by Tharp and others (245), Morgan's new German word list (211), Altrocchi's list (124) of Italian and English cognates, Knease's Italian word list (197), and Zinno's Italian word list (255). All of these studies, except the Italian, have a few common characteristics. They use the frequency counts of the Modern

Foreign Language Study as the point of reference; they aim at a minimum requirement of one or two years in high school or one or two semesters of college; they modify (by the addition of material selected on a subjective basis) the original lists established on an objective basis. It is too early to estimate the real worthwhileness of these new lists; very likely they will be tried out cautiously by teachers and makers of textbooks and curriculums and will tend to determine the minimum requirements for first- and second-year work at the high-school level and for first- and second-semester work at the college level.

Recently, Swenson and West (243) contributed a study on the theory and technic of vocabulary control with rating scales for changes of meaning, for idioms, for cognates, for compounds of known elements, and for spelling-pronunciation discrepancy. While the principles set up for evaluating the items of frequency counts of the reading and speaking types aim to meet the objections raised against the present use of word and idiom lists, the rating scales, established by the authors as a corrective measure, appear too complex and too subjective to solve the problem in a satisfactory way.

### Reading Method Studies and Textbooks

Generally speaking, method is implicit in the type of textbook employed. While it is safe to say that the great majority of grammars and readers in use at the present time are distinctly of the modified direct, or eclectic type, yet it is clear that a new kind of beginning material, judging from the output of various leading publishing houses, is rapidly making headway. Some texts published by the Oxford University Press (171) are written by French writers and adapted so as to bring the vocabulary within the limits of the words most frequently used as established by the Vander Beke list. Thus far there are three series of volumes which are designed for rapid reading, the first volume of each series having a word frequency basis of 1,000; the second, 1,100; the third, 1,200; the fourth, 1,300. Another set of books consists of a grammar, simplified and graded reading texts, and a workbook, all highly coordinated, constructed and centered on the reading goal as the main objective in the first two years of French in high school (157). A third set of books, while making use of the devices just mentioned, prefers to give the meaning of the unusual word or expression rather than to simplify or adapt a masterpiece (137, 184). A fourth set of books, edited by Ford and Hicks (163), also follows the recommendations of the American and Canadian Committees on Modern Languages in regard to the use of frequency lists, recognition grammar, and adapted or simplified texts. Various other new-type tests have been published but most of them are too recent to have produced a marked change in methodology. However, a study by Cheydleur (141) of the effectiveness of the reading method demonstrated that, as a rule, it yields very substantial increases in vocabulary and comprehension accompanied, generally, by a real decrease in grammar achievement. The study also revealed that in the case of superior

students, this method yields results in all three language aspects inferior to none. Coleman (149), under the head of technic, experiments, and materials, reported about threescore studies on reading and we have found about a score more on the same problem. As space is limited, we refer those interested to Coleman's bibliography (149) for the former and to our own list (nos. 124-255) for the latter. It is regrettable that many of these studies rest to such an extent on subjective opinion, or are based on such limited experimentation, as to render their conclusions of questionable value. The more significant studies on the reading method include those of Bond (134), Cheydleur (145), Cole (148), Eddy (159), Mullins, Stone, and Read (213), and Palmer (220, 221).

**Methods in General**

After reading and weighing recent contributions in the field of the classics, we have great sympathy with the contention of Morgan (212), who would settle the claims of various methods by means of standardized tests rather than by theorizing. While not going so far, Hutchinson (186) and Peters (226) set forth the advantages as well as the limitations of the new-type tests for Latin teachers, and Hartmann (176) showed that even in France, as a result of the investigation of the examination for the baccalauréat, a more objective method of grading the papers was recommended. Land (200) demonstrated the effect of the Classical Investigation on the amount of reading of standard authors, "made" or adapted Latin, and selections from the classics, which might be characterized as a liberalizing element in a lock-step system without a lowering of standards. Four studies by Marouzeau (203), Brun-Laloire (139), Bezard (132), and Pagot (218) demonstrate ways and means of breaking with the formal method of teaching Latin in the lycées by vitalizing the instruction, one by a sort of reading method, another by the omission of grammar, dictionary, and paradigms, and a third and a fourth by the use of linguistics, among other means. While these are a few hopeful signs of a progressive element in the field of ancient languages, there is much need of research workers like Hutchinson (185) for problems in grammar, syntax, and reading.

The trend toward the reading method in French has a counterpart in German. The readers edited by Hagboldt, Morgan, and Purin (173) are based on vocabulary and idiom frequency counts, on the West principle of the density of words, and on graded syntax and content material. However, recent studies by Meisnest (207) and Griebsch (167, 168, 169), and there are many such, indicate quite clearly that the direct method, with its variations, continues to be well practiced and supported in this country. In her report on foreign language instruction at the secondary-school level, Eddy (158) indicated a transitional period in which the Classical Investigation and the Modern Foreign Language Study are gradually making themselves felt by their influence on the traditional fourfold aim.

## Grammar and Syntax

Coleman (149) and Tharp and others (245) furnished information about approximately threescore studies on grammar and syntax. Cheydleur (143, 146), in two experiments, showed that functional grammar yields better results than formal or theoretical grammar and that it also reduces student mortality. Peters (227) demonstrated the advantages of the direct method over the grammar method, but her conclusions are based on insufficient data to offset the earlier opposite findings of Cheydleur and those of Pargment (222). Remmers and Fotos (230) tried to prove by the intercorrelation of certain language aspects that knowledge of the subject tends to develop as a whole; earlier studies on the significance of intercorrelations by Wood (249), Henmon (180), and Rice (231) would lead us to believe the opposite, namely that there may often be low correlation between two language aspects and high between two others in the same group. Schwartz (237), Vexler (247), and Yvon (254) each gave an analysis of the new grammar of the French Academy, pointing out among other things why it was a best seller in spite of many glaring faults. Sparkman (242), while defending grammar as the framework of all language study, advanced a rational argument in favor of aural drill as a means of reinforcing and vitalizing recognition-reading training.

## Phonetics, the Phonograph, Radio, and Movies

Nearly fifty studies dealing with these subjects have been analyzed by Coleman (149). The conflict between teaching pronunciation by imitation of the teacher alone and the use of phonetics, while not ended, finally favors the latter. The many disciples of Viëtor, P. Passy, D. Jones, and Novarro Thomas have made phonetics part and parcel of the best teaching practice and methods in this country, not merely in universities like Ohio State, Chicago, and Wisconsin, but also in state educational systems like that of New York. The phonograph as an auxiliary in aural-oral training has been developing for about a quarter of a century until at the present time there are in wide use excellent records of different makes in many foreign languages, from those offering drill on vowels and consonants to the best classical, literary, and musical selections. Proper texts to accompany the records are now available for private use or class instruction. While contributions like those of Hieble (182) and Schwartz (236) are valuable for the information they give concerning the uses of the phonograph, more studies like those of Waltz (248) to determine the relative values of teaching pronunciation by class and laboratory methods are needed.

The radio as an aid in aural-oral drill has been in vogue for about ten years; the movies for only a few years. According to Lumley (202), whose conclusions were based on two groups of students, one listening to radio French lessons and the other not listening to such lessons, radio instruction influences pupil pronunciation favorably. Bolinger (133), Hendrix (179),

and Koon (198) offered ample data testifying to the popularity of modern language instruction on the air in this country and abroad.

The *Education Index* lists scores of studies regarding educational films in Europe, South America, and the United States. In our own country, for example, they are extensively employed in several universities of which the following are typical: Arizona, Chicago, Harvard, Ohio, Washington, and Wisconsin. At Wisconsin, for the past two years, Russian, Spanish, Italian, German, and French movies have been given, generally under the auspices of the various language departments; these have been practically all plays which attracted only a relatively small attendance, due partly no doubt to the foreign language used and the inferiority, as a rule, of the European cinema technic, rather than the nominal cost. Practically the whole number of *L'Education* (154, 160, 177, 201, 208) for March, 1932, is devoted to cinema from the social, pedagogical, and psychological points of view. Ducasse (155) urged the use of the film and the disk in the teaching of history, geography, and literature. Space allows only two more references on the subject: a series of articles by Jüer-Marbach (193), and a controlled experiment by Arnspiger (126) on 350 science and 250 music students, which demonstrated the superiority of the group taught by the sound pictures over the other group. It is such experiments as this one that are needed in the language field.

A valuable contribution by Palmer (221) furnished a cross-section of experimentation in foreign language methodology. Controlled experiments in adult learning by Fraser and Crawford (164) and by Cheydleur (142) offered evidence that adults can do superior work in Spanish and French in comparison with youth either in school or college. These studies confirm the findings of Thorndike and others (246). Individual differences are provided for by the use of placement and attainment examinations as shown by controlled investigations carried on by Cheydleur (142), Richardson (232), and Seibert and Goddard (239). Such investigations are bound to affect methods by concentrating on definite achievement in three or four attainable aims rather than on the accumulation of grades.

**Psychological Studies**

The reemphasis on the reading objective has aroused an especial interest again in the psychological processes underlying the learning of a foreign language and, in particular, the relation of oral-aural skills to reading ability and the importance of oral and direct methods in developing it. Book (136) gave a detailed psychological analysis of the task of learning to read Latin. Patterson (224) attempted to set forth, diagrammatically, stimulus-response psychology as applied to vocabulary learning, incidentally making categorical and questionable observations concerning vocabulary building and testing. Palmer (219, 220, 221) urged the importance of oral and direct methods as an initiation to reading, and, as against West's principle of specific practice, made a distinction between

fusion, which requires oral-aural practice, and identification, which may not require it. He also stressed the importance of oral-direct methods in developing right attitudes toward reading a foreign language. Sparkman (241), on the other hand, suggested that we can and should postpone training in self-expression until a recognition acquaintance of the language is acquired. McIntosh (205) insisted that reading ability cannot be very lasting unless a pupil can speak and understand the spoken language. Hagboldt (174) noted that there are three types of memory—visual, auditory, and motor—and since, in most individuals, each type is represented in varying degrees, all types should be utilized in language learning. He also urged that while the direct method, which is a combination of the grammar, natural, psychological, and phonetic methods, represents the best in linguistic pedagogy, it is not the best for the American school situation with its two-year course. C. E. Young (250) likewise insisted that there is no one best method and recommended the choice of the elements of various methods which will best fit conditions. Seibert (238) checked, in a series of five experiments, certain well-established results of laboratory experiments on economy in verbal learning, and found for learning French vocabulary that studying aloud is more efficient than studying silently; that vocabularies are better learned in associated pairs than in sentences; that the whole method is better than the part method; that distributed relearning over a period of ten days is more efficient than the same amount of relearning concentrated in one sitting after ten days; that the recitation method is better than the reading method; that there is a negative correlation between time of learning and amount retained; and that there is a fairly high correlation between immediate and delayed recall, and between the amounts retained by different methods. Handschin (175), as against the second principle, however, maintained that context learning is more economical. Gullette (170) stressed the importance of focalization, repetition, and mind-set. Gray (166), in an experiment on memory, found no appreciable differences in the learning and retention of prose and poetry. Kennedy (196) reported experiments on the retention of Latin syntactical principles after various time intervals.

The problem of transfer usually bulks large in discussions of foreign languages, but there is only one experiment to report. Johnson, Hinderman, and Ryan (190) studied the transfer effect of one or more foreign languages to the ability to get meanings in an unfamiliar language, the results indicating that the gain from language study is more a matter of vocabulary than general interpretative ability. Bradley (138), in an interesting article, urged that foreign languages provide the most effective exercise for developing habits conducive to competency in rational thinking and that Greek and Latin are superior to modern languages for this purpose.

Valuable studies of errors were reported by Harvey (178) for French written composition in the College Entrance Board examinations, and by Hunsberger (183) for Latin vocabulary.

# CHAPTER IV

## Science

RESEARCHES in the psychology and teaching of science may be presented under three heads: (a) comparisons in attainment following different teaching procedures; (b) learning studies in which efforts are made to analyze the psychological processes exercised in learning; and (c) studies of the effects of learning on behavior. These classifications are not sharply defined but they suggest major emphases. In the first, the technic commonly employed is one of control and experimental groups. The investigator attempts to match one method against another. The teaching procedure is more or less routinized. The studies in the first grouping differ from those in the second and third groupings in that little or no attention is given to the psychology of methods used in the experiment.

### Comparisons in Attainment Following Different Teaching Procedures

Bruce (259), working with classes in high-school chemistry, compared the achievements of students taught by the unit method (Morrison plan) and by the traditional daily assignment. About 50 students were taught through one year following the unit plan. The results were compared with those obtained from an equivalent group taught the preceding year by the traditional method. An examination, mostly objective, made up of items grouped under the following seven divisions, was used for measurement: (a) reasoning and memory (true-false); (b) memory of facts (completion type); (c) common and chemical names; (d) problems—skill in practical applications; (e) commercial processes—practical applications; (f) equations—formal application of principles; and (g) a composition on chemistry and the home. Considering the test as a whole, the final score shows a slight gain in favor of the daily assignment method. The pupils were tested for relative retention by using the same test one year following the close of the period of instruction. The results show considerably more retention in three parts of the examination, namely, part three, memory of common and chemical names; part five, commercial processes and practical application; and part six, formal application of principles in writing equations. The total results showed 6 percent greater retention under the unit plan. The sum of the scores on the test of retention was 65 percent of the sum of the scores in the original test in case of the daily-assignment group. For the unit-plan group, the corresponding percent was 71.

In this, as in other similar efforts in educational research, the questions concerning the dependability of results arise. Concerning the experiment,

the author says, "With the first group, the instructor had no thought of any method but the old type daily-assignment method. He had, as a result of ten years' experience, developed an appreciable degree of skill in its use and was achieving, by it, everything within his ability. . . . With the following year's classes, the instructor entered upon the unit assignment with all the zeal and skill he could muster. . . . So," he says, "the record would stand as a closed verdict on that [daily-assignment] method."

But does it? The reviewer wonders how much is due to "zeal" in the experimental class and to the lack of zeal in the control. The question arises, too, concerning the reliability of the parts of the tests for the purposes named. There is no evidence to show that the true-false items, for example, are valid measures of reasoning and memory.

Shelton (271) used a somewhat more elaborate statistical procedure in evaluating the progress of classes in general science taught by the unit plan and the daily recitation method. He found "little justification for saying that one method was superior to the other." Conflicting conclusions are suggested in these reports by Bruce and Shelton.

Bent (257) compared equated groups in ninth-grade general science in which the experimental groups used no regular text. Pupils selected a unit for study and made their own plans. The work selected in the experimental group was assigned to the control group. Each pupil in the control had a text and laboratory manual. Groups were tested for immediate recall and for retention. Results suggested that the experimental group excelled in immediate recall and the control group excelled in retention. Differences were not statistically significant.

Klopp (266) compared the relative effectiveness of textbook, lecture, and telling-demonstration methods in a teaching experiment carried through an interval of nine weeks, involving 700 pupils and 16 teachers in general science. By the criterion of final test score, he found the lecture method best and the textbook method second. By the criterion of proportion of possible progress in learning, he found the telling-demonstration best. There was evidence that neither method was best for all types of units.

Many studies reporting comparisons of various methods of laboratory and demonstration teaching have been reviewed elsewhere. Stuit and Engelhart (273) have summarized the more important studies. Most of these are reports of experiments in high-school teaching. Payne (269), working with college students, compared lecture-demonstration with individual laboratory method. He reported that students make better progress in the study of college chemistry when new topics are introduced by a lecture-demonstration.

Stathers (272) reported a practical and convincing study of the relative merits of teaching with micro-projector and with individual microscopes. Paired classes were used and the experiment carried through an interval of twelve weeks. The results showed statistically significant differences favoring the micro-projector.

Studies by Wyman (274) and by Huebner (263) raised questions of relative values derived from different teaching aids, including slides, moving pictures, models, and museum exhibits. They also suggested an effective approach to the study of the important questions regarding relations of experiences to learning outcomes.

An outstanding piece of research in connection with visual aids is the study by Rulon (270) on the effectiveness of sound pictures. Two thousand pupils were used in experimental and control groups. A special textbook was compiled to accompany eight reels of picture. The experimental group showed marked gains on both immediate and delayed recall tests. There were significant differences between gains made by films showing physiographic material and films showing biological material, the differences favoring those on physiography. The statistical treatment of data is thorough and the conclusions are convincing.

**Learning Studies**

Hurd (264) has continued his series of studies in teaching physics in which he has directed attention primarily to causes of difficulty. The purpose of one experiment was: "To use an individual plan of instruction, based upon the analysis of pupil responses to preliminary test items, for securing complete learning of the unit elements." A unit of instruction in electricity was used in the experiment. Detailed directions were given for work through an interval of eighteen days. The unit was planned to secure complete learning of the minimum essentials represented in part by preliminary test items. Preliminary tests were given and scored during the first day. On the second day a "project program" was discussed and individual projects related to the unit were selected by the students. On the third day the test papers were returned. Then followed a period of intensive instruction through ten days. During the next five days there was intensive application to the errors caused by difficulties in the test. Pupils made lists of points concerning which they desired explanation. Activities of many kinds, including a final discussion of the preliminary test, were used to clear up difficult points.

A final test, like the first except for minor changes in the wording of the items, was given on the eighteenth day. Test items were of the short answer type. In the experiment, it was assumed that the test is a measure of minimum essentials. The results showed the effects of this program of instruction upon ability to answer the items of the test. Obviously, schools following this plan of instruction will do better on these tests than "control schools." The results from the experiment seem inconclusive for there are no comparisons of attainment on tests other than those used for instructional purposes in the "experimental schools." No criteria for the selection of minimum essentials are given in the report.

Hurd's experiment (265) of 1932-33 was similar to the one of the preceding year with additional emphasis on "projects." An additional feature

of the report is the "trait rating on self-reliance, systematization, and industry." The results in achievement were similar to those of the preceding year. The results from "trait-ratings" seem inconclusive, but interesting questions are raised.

Bail (256) reported an exhaustive study of efficiency in mechanics as this division of physics is taught in high school. He used 152 concepts rated as valid according to defined criteria. Drill exercises were prepared, using items related to these concepts, and administered to some 2,100 students in 43 school systems. Difficulties were determined from analysis of the errors made in response to the items in the drills. The contribution from this investigation is the determination of "dominant" (recurring) errors. "Even though there were many different wrong responses recorded to a large majority of the exercises, for 42 percent of the exercises there were dominant errors which comprise a large percent of the errors made to that particular exercise." A careful perusal of the wealth of detail in the study will be of value in future researches in the field. One wonders, for example, what gains in outcomes from instruction in physics would result if the findings and recommendations in this study were applied to teaching.

In a study of mathematical abilities in high-school physics, Carter (261) reported that ability to recognize mathematical concepts "seems to be an important factor in the comprehension of physics materials." He showed that this ability may be measured, and found it is correlated with other mathematical abilities and in a less degree with reading ability. He found, too, that this ability is more highly correlated with success in physics than is intelligence or reading ability. The work was based upon an analysis of mathematical abilities used in physics, general mathematical abilities, success in physics, and other factors. The statistical work is thorough and the conclusions seem to be well founded.

In his study of the construction of a diagnostic test for high-school chemistry, Malin (267) reported the difficulty of items and suggested measures for correction of recurring errors. The tests were comprehensive in the sense that a wide range of abilities was tested. Item analysis of responses revealed pupils' difficulties. The results revealed a low standard of attainment. There was evidence that errors were due to lack of understanding of principles. Many of the responses in valence, formula and equation writing, problem solving, and other features were chiefly mechanical, the student making no recognition of underlying principles. Some of the author's suggestions for remedial work would seem to perpetuate this mechanical learning. For example, he says, "the teacher should stress the fact that in such equations the elements or radicals exchange places." Such a statement seems to distract attention from what goes on in the test tube. In another place he says, "stress the fact that elements in the gaseous state usually have two atoms per molecule, while elements in the solid state . . . have but one atom to the molecule." Stressing this point certainly does not aid the student to think through the processes in chemical changes. The practice of writing formulas of solid elements by showing only one atom in the mole-

cule is merely a convention, supported by the Principle of Parsimony. Other illustrations might be given but in general the work is well done. Chemistry teachers seeking a clearer comprehension of their difficulties should read it.

Bray (258) studied the relations between several abilities, and ability to achieve success in college chemistry. He reported large individual differences in the several abilities studied, including general intelligence. By the method of correlation, he found substantial relationships between ability in chemistry and (a) general reading ability, (b) knowledge of vocabulary, and (c) general intelligence. "Results of partial correlations indicate that of all the measures employed in this study, which might be used for predicting probable success in the study of college chemistry, the battery of Special Tests is most efficient." He found almost certain differences favoring ability to succeed on the part of students who have (a) graduated from large high schools, (b) learned to read in large city systems, and (c) studied chemistry in high school. Those who take chemistry as an elective usually do better than those who take it as a requirement and men usually excel women. In this study the statistical technic seems adequate for the data and the conclusions seem to be well founded.

### Effects of Learning on Behavior

Clemensen (262) conducted a learning study in high-school physics using study outlines.

> [In the construction of these] the keynote of the work was organization; no single unit was written without a consciousness of its relationship to all others and no single problem within a unit was formulated as an item by itself. . . . The basic aim in making this study was to help pupils to develop worthy habits, ideals, and attitudes, in short to foster "desirable dispositions." It was hoped that this objective could be accomplished by means of the specific subjectmatter and concepts of physics because these "dispositions" are really specific in nature; one cannot have an attitude without having an attitude toward something, and one cannot have a thought without something to think about—that is, a "disposition" is meaningless unless it is a disposition to act in a certain way.

The philosophy of Dewey and Kilpatrick and the psychology of Thorndike were used for guidance. Results were measured with a standard test in physics, by an analysis of essays written on selected topics involving physical phenomena, and by a questionnaire to the students designed to reveal the nature of habits and attitudes. Comparisons were drawn between results from classes in which study outlines were and were not used. The results show "that assignments in the form of specific questions organized in outline form in a conscious attempt to develop the larger concepts of the subject are effective in producing factual learning such as is measured by new-type tests and also conceptual learning such as becomes evident when pupils are merely asked to write on a given topic." The concepts tend to be of a "broader and more generalized type," than concepts formed by other methods of study. There is evidence from questionnaire results that

the use of the study outlines tends to develop the habit of seeking and expressing causal explanations of science phenomena, "which may be considered one definable phase of the problem-solving attitude or scientific attitude." There is evidence, too, of better study habits, greater interests, and better understanding of relations. The striking and unique feature in evaluating results is the use of essay tests and student questionnaires. The conclusions seem well supported by adequate statistical treatment of the data. In the opinion of the reviewer, this is the most significant study yet reported of the effects from experience in learning science upon the behavior of the learner.

Caldwell and Lundeen (260) reported a curriculum study of material designed to correct unfounded and superstitious beliefs. Results from tests indicate that the material is effective.

In an analysis of scientific thinking, Noll (268) defined six habits which are considered to be a part of such thinking. He designed tests for detecting these habits. This series of articles is preliminary to more extended study.

## Summary

The reports of studies reviewed in this article have been selected from a list of about one hundred titles. There is an enormous range of difference between the best and the poorest of the reports found in print. The weaknesses which recur with greatest frequency are those which arise because of lack of adequate educational theory on the part of the investigator. The practice is still much in evidence of gathering numerical data, applying a more or less routine statistical technic, and reporting results. Such results cannot be meaningful unless there is a clear statement of the conditions under which the data were gathered. In the opinion of this reviewer, the most promising questions for research study are those relating to the manner in which precise concepts are attained and those which relate to the manner in which learning influences the behavior of the learner.

# CHAPTER V

## Mathematics

RECENT researches relating to the teaching and the psychology of learning of secondary-school mathematics tend to be concentrated on a few aspects of the field. Most numerous are (a) those concerned with the relationships of various prognostic factors to achievement, and (b) those having to do with the relative effectiveness of various types of large unit and individualized form of supervised study technics. Other fields relatively well represented are types of errors and difficulties, sex differences, and permanence of retention. Strikingly unstudied of late have been the problems of the transfer of training, the relative efficacy of diagnostic and remedial technics, the effectiveness of various methods, and the distribution of drill or practice.

From the following review have been omitted many reports of investigations for one reason or another, e.g., small number of pupils involved, inadequate control of non-experimental factors, and failure to furnish data pertaining to the reliability of obtained differences and relationships. Some studies are reported here as supplementary data, though when considered separately they may not furnish dependable conclusions.

### Prognosis: Relation of Achievement to Predictive Factors

Some forty-five to fifty studies have reported coefficients of correlation between some measure of achievement in secondary-school mathematics and one or more variables which may have prognostic value.[1] The coefficient of correlation between the same abilities varies materially with fluctuations in homogeneity of the groups of pupils involved, with the relative reliability of the tests or other measures of the abilities, and with other factors. Hence, it is hazardous to compare coefficients not based on the same groups of pupils and equally reliable measures of the abilities. The following implications from the reported studies are, therefore, offered subject to such limitations:

1. With respect to the accuracy with which achievement in mathematics at the secondary level may be predicted, the following predictive bases are mentioned in order of merit.
   a. Good prognostic tests such as the Orleans Prognostic Tests for algebra and for geometry, and the Rogers Mathematical Ability Tests.
   b. Mathematics mark for previous year.
   c. I.Q. (intelligence quotient).
   d. M.A. (mental age).

[1] Because of space limitations, these studies are not mentioned individually here. A tabular summary and discussion of these studies together with a fairly complete bibliography of them prepared by the author of this chapter will appear soon in an educational periodical.

e. Achievement tests in arithmetic or algebra.
f. Average mark in previous years.

2. The reported coefficients for the same variables vary widely, but in general they seem to cluster around the following ranges:

*Beginning Algebra*

| | |
|---|---|
| 1. Prognostic test score | .58 to .64 |
| 2. Mark in eighth-grade arithmetic | .48 to .52 |
| 3. I.Q. and arithmetic test score | .45 to .50 |
| 4. Average mark in eighth-grade, intelligence test score, and M. A. | .40 to .45 |

*Geometry*

| | |
|---|---|
| 1. Prognostic test score, I.Q., and mark in algebra | .50 to .55 |
| 2. Intelligence test score and M.A. | .45 to .50 |
| 3. Average mark in previous grade | .42 to .47 |
| 4. Algebra test score | .40 to .45 |

In the above tabulation no distinction is made between the correlations obtained when standard test scores were employed as measures of success in mathematics and those obtained when final marks were used. There is no material difference between the coefficients for the two criteria of success.

3. Available data do not seem to indicate that any one test of general intelligence for high-school pupils possesses superior prognostic qualities as compared with the others.

4. The predictive value of marks in previous work will depend upon the extent to which the pupils whose success is to be predicted come from the same school or the same teachers and the extent to which the marks used as a predictive basis are based at least in part upon objective marking and are influenced little by attendance, deportment, personality of pupils, and other factors not necessarily correlated with achievement.

5. Prediction may be made with materially greater accuracy if two or more prognostic measures are employed. The best combinations for algebra always include the eighth-grade average mark and I.Q., or score on a good prognostic test, or both. Little is gained by employing more than three predictive variables. Likewise, in the prediction of success in geometry, a combination of bases is better than any one variable. The best combination will always include score on a good prognostic test, mark made in algebra, and I.Q.

6. The coefficients reported for the most carefully conducted studies are sufficiently high that, when allowance is made for the unreliability of marks and test scores as measures of achievement, it is clear that achievement in algebra or in geometry may be predicted fairly accurately for prospective pupils. To do this, at least two, preferably three, of the best criteria must be combined. The error in prediction is almost certain to be less than half of that resulting from chance guesses.

Although there is not agreement among the studies, it appears that achievement in mathematics can be predicted with about the same degree of accuracy as achievement in other "academic" subjects, and with definitely greater accuracy than achievement in art, science, physical education, and household or industrial arts. The various factors correlate less definitely and less closely with mathematics than total high-school achievement and tend to do so slightly as compared to English, Latin, and history. In mathematics as in other subjects, correlations between various factors and marks or achievement test scores tend to become smaller with advance from lower to higher grades through high school and college.

## Supervised Study; Large Unit Assignments; Individualized Instruction

Recent experimentation does not warrant any indisputable conclusions as to the relative effectiveness of large units versus daily assignments or of individualized versus group progress plans of instruction; but when all the reported experiments are considered together, the presumption should probably be in favor of the larger units and the individualized methods, especially for brighter pupils. Although the results also are not uniformly favorable, recent studies seem to affirm the conclusion of previous investigations that supervised study contributes to greater achievement of a class as a whole, particularly if the type of plan is adapted to the level of ability of the pupils and is skillfully employed. It seems justifiable also to infer that supervised study with smaller unit assignments is better for less able pupils and that better results with superior pupils are obtained by employing larger unit (or contract) plans.

Williams (328) matched two sections in advanced algebra composed of average and superior students. One was taught according to a modified Winnetka contract plan and the other by the conventional daily recitation plan, both by the same instructor in the Altoona, Pennsylvania, High School. Pairing was on the basis of I.Q. (National Intelligence Test) and marks in beginning algebra. Gains were measured by the Thorndike Algebra Test for the first semester and the Co-Operative Algebra Test for the second semester, Form A of the respective tests being given at the beginning of the semester and Form B at the end. In seven of the eight comparisons of gains, the differences favored the contract method. In the one exception, the difference is not statistically reliable.

Stallard (314) found that for superior students the large unit plan of supervised study was superior to daily R-S divided period plan of supervised study, and that the daily plan was better for pupils of average ability, though the latter differences were not completely reliable.[1] For 24 pairs of pupils of high I.Q. (105 to 121, mean = 116) equated on the basis of I.Q. (Otis Self-Administering Intelligence Test) and scores on the arithmetic section of the Stanford Achievement Test, he found differences in gains on the Douglass Standard Survey Algebra Tests during the first semester of beginning algebra favoring the large unit plan with a minimum of recitation. These differences were such as 97 times in 100 would not have occurred as the result of chance. For 24 pairs of pupils ranging in I.Q. from 94 to 116 (mean 105), he found differences in favor of the daily R-S divided period plan for which the probability of results being due to chance was 17 in 100.

Hunzicker (295), on the contrary, found the daily recitation plan superior to a large unit plan of supervised study during the second semester of both beginning algebra and geometry, though negligible results in favor

[1] By complete reliability is meant that there is less than one chance in one hundred that the difference obtained could have resulted from chance errors of sampling and measurement.

of the large unit plan were obtained for the first semester of algebra. Equating his groups of 19 pairs of pupils in two sections of algebra, and 15 pairs in two sections of geometry, and reversing the methods with the groups for the second semester, he measured the gains in algebra by means of the Douglass Survey Algebra Tests and a test prepared by himself, and the gains in geometry by means of a test of his own making. In each semester the difference for geometry favored the daily recitation plan by an amount attributable to chance errors by a probability of only 14 in 100. In the second semester in algebra the difference favored the daily recitation plan, and was such as could be attributed to chance errors by a probability of less than 1 in 100. Neither plan seemed peculiarly suited to bright or less able pupils.

Gadske's findings (293) based on 100 pupils unmistakably favored large unit assignments and supervised study as compared to an R-S plan of supervised study in first-year algebra. His groups were paired on Otis Group Intelligence Test I.Q.'s and on scores made on the arithmetic and reading sections of the Stanford Achievement Test. Progress was measured in terms of gains on the Columbia Research Bureau Algebra Test. The differences were easily statistically significant at the end of each semester, particularly for the second, and seemed to apply to pupils of all levels of ability. In a well-conducted study, Eilberg (291) found the contract method better than the recitation method in teaching plane geometry to two equated groups.

Drake (289), working with 22 pairs of average and superior pupils in first-year algebra in the University of Minnesota High School, compared the relative effectiveness of two methods of employing a three-level large unit assignment plan. In one, the pupils progressed through the course at their own individual rates and in the other the pupils started each subunit of approximately a week's work at the same time. The groups were paired with respect to chronological age, the median of five I.Q.'s based on five different mental ability tests and achievement at the end of the first five weeks. Progress was measured by means of the state board examination in algebra, two final examinations, and unit tests. Differences in the state board and final examinations favoring the individual as compared to the individual-group plan were statistically highly significant, the chance being less than 1 in 100 in each case that the difference could be attributed to chance errors. It should be noted, however, that the individual method required more student time. The superiority of the individual method seems to apply equally to pupils of greater and of lesser ability.

Welchons' results (323) also favored the individualized method as compared to the commonly used general classroom method. McClintock (303) studied the value of individualized instruction for repeaters in second-semester algebra. Equated groups were used and rotated. The evidence was quite clearly in favor of the experimental method.

Allen's study (275) is unique in that she attempted to measure the relative effect of two methods—the individual and recitation methods—not only upon gains in achievement in subjectmatter, but also upon personality, honesty, vocational interest, and opinions on public matters. Two groups, 50 in all, of the eleventh-grade students in plane geometry at the Altoona, Pennsylvania, High School were paired on scores made on Terman Group Test of Mental Ability. Growth in achievement was measured by administering the Cooperative Geometry Test, and the Rogers Test of Mathematical Ability (geometry section). Changes in scores on the Berneuter Personality Inventory, Miller Self-Marking Test (honesty), Strong Vocational Interest, Blank and Watson Test of Public Opinion (prejudice), were studied. Superior gains of statistical reliability were found for the individual method with respect to the following personality character traits: dominance, submission, honesty, and lack of neurotic tendency, as well as for achievement in geometry.

**Sex Differences**

Investigations seem to show that boys reach higher levels of achievement than girls of the same grade, age, and general mental ability. Early studies include those by Thorndike (319) and Minnick (305). Thorndike gave four problems in arithmetic to approximately 4,500 pupils in grades six, seven, eight, and nine in Massachusetts schools, and reported that 60 percent of the boys exceeded the median score of the girls. No data relative to the respective averages of intelligence or age of the two sexes were reported. Minnick compared the marks of 150 boys and 243 girls made in the four years at the Bloomington, Indiana, High School. The boys received slightly higher marks in mathematics, though they received a slightly larger percent of failing marks. Girls made higher marks than boys in other subjects.

Stokes (316) reported that in two classes in algebra in the University of Minnesota High School no significant difference was found between the sexes as to sustained application during the recitation periods as measured by the Morrison device for measuring attention, an observer being assigned to each pupil.

Butler (283) found among 1,377 pupils in grades seven, eight, and nine in 9 schools differing in size and type of organization, that boys surpassed girls slightly in their mastery of mathematical concepts as judged by Schorling's test of concepts.

Webb (322) compared the achievement on the Webb Geometry Tests of 349 girls and 410 tenth-grade boys in 5 large high schools in or near Los Angeles, California—the two sex groups being chosen so as to be of equivalent average I.Q. based upon the Terman Group Test of Mental Ability. Apparently no differences were observed between conditions of instruction or teaching. Boys were found superior to girls by amounts (3.3 to 3.9 times standard error of difference) clearly not attributable to chance. The difference is most marked at lower levels of mental age, girls of the

mental age of 18.6 and more being slightly superior to boys of the same age. Girls were found to be more variable in their achievement than boys.

These results agree with those reported by Touton (320), but not with those by Perry (308). Touton reported from a study of the achievement of 2,800 New York City high-school pupils on a test involving "original" proofs that the median score of the boys was higher than that of the girls, that they made more perfect scores, and that, in general, boys were less variable than girls. Perry reported that girls in his study reached a higher degree of achievement in the solution of exercises in geometry.

Madsen (301) reported the average I.Q. (Army Alpha) of boys failing in algebra in Omaha high schools to be 111, as compared to 99 for girls, suggesting superior achievement by girls of the same I.Q.

Eells and Fox (290) also found boys superior to girls in achievement in high-school mathematics among 6,000 first-year students in California junior colleges. While boys made slightly superior scores on the American Council of Education Psychological Examination (138.0 to 136.8), they made greatly superior scores on the mathematics section of the Iowa High School Contest Examination (34.74 as compared to 25.20). When groups of boys and girls, equalized as to age and high-school preparation, were selected for study, there was still a distinct and significant superiority by boys. An analysis of 100 papers chosen at random indicated that boys attempted more problems, i. e., worked faster than the girls.

### Errors, Diagnosis, and Remedial Teaching

A number of detailed studies of the frequency of types of error in high-school mathematics have been made which do not eventuate in a few generalizations that may be summarized briefly, but rather in detailed frequency tables which require more space than is available here.

Silas (313) employed a revision of McCollough's drill tests in algebra, which he had administered close to the end of the school year to 15,217 pupils in 507 classes in 61 experimental centers in 21 states, sampling every type of school and community. From the mass of detailed data carefully organized, he concluded that: (a) about one-fourth of the errors are of the cognitive type and three-fourths of the manipulative type; (b) insufficient emphasis is placed upon the unit skills; (c) the pupils too frequently work mechanically without insight; (d) the fundamental concepts are not sufficiently established; and (e) mental sets established in arithmetic operate as interference factors.

Waggoner (321) confined his study to the ability to solve linear equations of one variable. His subjects were 608 ninth-grade pupils in eight town and city schools of Iowa and one city high school in Illinois, ages thirteen to nineteen, I.Q.'s 67 to 129, mean 101, to whom a test of 27 equations was given after eight months of instruction. Of the errors, 62 percent were due to inability to recognize what to do or inability to perform what was recognized as necessary to be done. Ninth-grade pupils comprehend little of the mathematical relationships used in solving linear equations

of one variable; they have not been trained to think through the processes but rather to manipulate terms according to some pattern.

Buckingham (282) made an analysis of the errors of 100 students selected at random from 368 in first-grade algebra in the New Trier Township High School at Winnetka, Illinois. These students were given a diagnostic test in the fundamentals of beginning algebra at the end of six weeks, twelve weeks, and twenty-four weeks of instruction. The frequency of errors in addition and subtraction was high; addition and multiplication were very much confused with one another; likewise subtraction and multiplication; and the frequency of errors with respect to signs was high. The recurrence of the same type of errors throughout the year indicated a need for continued diagnosis and remedial instruction.

Lueck (299) administered the Douglass Diagnostic Algebra Test to 280 students in first-year physics classes in 5 Iowa colleges. The mean number of problems solved was 16.4 of the 35 problems as compared to the high-school mean of 21.8, which was exceeded by only 27 percent of the college students. The principal weaknesses were related to quadratic and simultaneous equations, fractions, fractional equations, fractional exponents, graphs, and to the formation of equations.

Coit (285), after analyzing the results of tests on arithmetical and algebraic addition, subtraction, multiplication, and division given to several hundred freshmen, juniors, and seniors in four Seattle, Washington, high schools, and to an unreported number of students in the department of school administration at the University of Washington, reported that weaknesses in fundamental concepts and skills persist throughout high school and college and that they disappear only after diagnosis and directed drill.

MacRae and Uhl (300) tabulated the errors of 104 pupils on tests on the four fundamental processes in algebra, and classified them according to type and process. Multiplication and division were especially resistive to remediation, particularly with respect to errors of signs.

### Permanence of Retention

Stokes (316) found that his students in the University of Minnesota High School were able to make a score on the Reeve General Mathematics Composite Scale about three-fourths as high after three months of summer vacation as at the conclusion of the year's work. At the end of twelve months' interval they still scored about the same proportion of their original test score. Stokes's data also appear to show that the percent retained is not materially affected by a difference between two plans of teaching, individualized self-instruction, and group instruction.

Wulff (331) measured the retention of some of these pupils at the end of twelve, some at the end of fifteen, and some at the end of thirty-six months, and retaught them. Some were measured and retaught both at the end of twelve and at the end of twenty-four months. The Reeve Scale was employed to measure achievement. Reteaching was carried on until the

proficiency reached at the end of the first year of instruction was attained. The mean relearning times were as follows:

| | |
|---|---|
| After twelve months | 5.90 hours |
| After fifteen months | 5.62 hours |
| After thirty-six months | 2.79 hours |

For the group retaught twice:

| | |
|---|---|
| After twelve months | 8.18 hours |
| After twenty-four months | 4.21 hours |

Mason (302) worked with 342 students at the University of Minnesota High School and also used the Reeve Scale. Retestings were made at three, twelve, fifteen, twenty-four, twenty-seven, thirty-six, forty-eight, sixty, seventy-two, and eighty-four months after conclusion of the course. Her data indicated that a very high percent of learning, 75 to 90, is retained at least for a few years, with little or no opportunity for review or practice, and that the very large majority of the loss takes place in the first three months. Though the numbers of subjects in the various units of this experiment are small, the similarity of the results invites confidence.

As opposed to the findings of Stokes and his students, White (327) working with 326 pupils in four Baltimore high schools found great losses in the first three to five months after the completion of ninth-grade algebra—losses approximating 33 to 59 percent as judged by the scores on two algebra tests. Corroborating the findings of Stokes, Mason, and Wulff, summarized above, as well as earlier studies in other fields by Ebbinghaus, Raddossawljewetch, Book, Bean, and others, White found much smaller, sometimes negligible, losses after the first few months, as indicated by retesting at eight, nine, and sixteen months. There was no significant difference between the sexes in retention; the younger and more intelligent pupils remembered more; and those intending at the close of the year of instruction to study more mathematics remembered better. Conspicuous among the skills more quickly forgotten were those involving negative and fractional exponents with numbers as bases, irrational equations, extracting of square root, and similar equations including one quadratic. Best remembered were the skills involved in setting up equations, multiplication and division of monomials, zero exponents, fractional equations with letters as bases, and linear equations.

Layton (298) studied the retention of first-year algebra by 39 girls and 12 boys, averaging somewhat higher than normal intelligence at Milne High School of the New York State Teachers College. After eleven months the average score on the repeated New York State Regents examination in algebra was only 62 percent of that obtained earlier. The boys lost more than the girls of the same I.Q. Forgetting was greatest with respect to fractions and fractional equations, quadratic equations, and square root.

As measured by retestings on alternate forms of the Douglass Survey Algebra Tests, Worcester (330) found a very high degree of retention (80 to 100 percent of original scores) of first-semester algebra after six weeks

and fifteen weeks, probably due partly to reviews during the second semester. He found on the other hand, considerable forgetting of second-semester algebra, the retest scores being only about 55 percent of the original ones.

Jackson (296) found that 95 boys at Mt. Hermon, Massachusetts, High School (average I.Q. 107) tended to forget skills and procedures in algebra, even though some opportunities to use them occurred. For example, on one typical unit the percent of correct solutions was 86, five days later, 75 and on final examination, 69.

**Drill, Practice, and Review**

Monroe's pioneer study (306) and later ones in which analyses of errors have been made, indicate the need for drill for accuracy as well as training for insight. Layton's study (298) [1] furnished evidence of the value of review and drill at the end of the year in algebra. After having a month of review following taking the New York Regents examinations, a group of 51 pupils retook the examinations and increased the score by 23 percent, though it is not known to what extent this gain may be attributed to practice effect and special self-training on the specific problems of the examination.

Hawkins (294) reported that special drill given to translating "English into algebra" yielded results. Of two sections in beginning algebra at the University of Chicago High School having equal mean scores on Otis Self-Administering Tests of Mental Ability, Breslich-Review Diagnostic Test on Fundamental Operations in Arithmetic and Problem Solving, and Breslich Summary Algebra Test, the one receiving especial attention on translating "English into algebra" did 5.8 percent better in test exercises on setting up problems. A second unit of the experiment revealed no advantage for either group.

Milholland (304) found only a very slight and insignificant difference between results obtained when pupils in algebra were required to hand in all problems as compared to the practice of handing in none. Eight algebra classes in the Arsenal Technical Schools at Indianapolis were employed in forming two equated groups for the study.

**Miscellaneous**

Only one study on the genetic aspects of mathematical achievement through the high-school years appears in recent literature. Butler (283) analyzed papers of 1,377 students in nine schools of different sizes and types of organization of a test of the concepts listed by Schorling in the *Mathematics Teacher* in 1925. He reported equivalent growth from grades seven to eight and eight to nine, pupils in the seventh grade apparently knowing one-third of the concepts, and those in the ninth grade two-thirds.

Stokes (316) [2] found a material positive correlation ($r = .567$) between attention scores and achievement on the Reeve General Mathematics Composite Scale.

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[1] Reported also in section on permanence of retention.
[2] Referred to in more detail in the section on sex differences.

Results favoring the use of mathematical "recreations" were reported by Patton (307). Pupils in two classes in geometry devoted one day a week to these recreations and surpassed on each of nine tests pupils in two other sections paired on scores made on Otis Self-Administering Test of Mental Ability, Hotz Algebra Scales, and Lane-Green Unit Achievement Test in Plane Geometry, Test IV. The nine tests included four Lane-Green Unit Tests, four Hart Geometry Test units, and the Columbia Research Bureau Plane Geometry Test. On the last named and on three of the Lane-Green tests, the differences were clearly beyond the influence of chance.

The theoretical advantages of teaching proofs in solid geometry by "generalization" from plane geometry were thought to have been realized in Shanks's study (311) of two classes in Culver Military Academy, in which on four tests the class taught by the generalization method, though slightly inferior in average I.Q.'s, made a better showing than the class taught in the conventional manner.

Sykes (317) reported the frequency of various practices employed in fifty schools in adjusting instruction to differences between pupils.

Bowman (279) found that 564 seventh-, eighth-, and ninth-grade students were more successful in solving arithmetic problems of types for which they expressed a preference and that this phenomenon was more marked with students of lower intelligence, due probably to the fact that they were less homogeneous as to preferences.

Welte (324) made a painstaking analysis of six tests in plane geometry, listing the most fundamental ideas and concepts involved and their frequency.

# CHAPTER VI

## Commercial Subjects

### Typewriting

FREEMAN and Abernethy (343) reported a study with 50 college students. One group learned the keyboard by means of a keyboard chart. The other group translated the letters into numbers and learned the numbers. The findings were that the use of overt movements as part of the learning process made the effect of learning more permanent over a ten-week period than when overt movements were not present.

Raubenheimer and Davidson (371) attempted to determine the effects of rest periods of from two to fourteen days on speed and accuracy of copying. Tests were given to 75 high-school students before and after weekends, Thanksgiving vacation, and Christmas vacation. Records of outside practice were also kept. Findings: Two-day rest periods retard gross speed, but increase accuracy enough to give a slightly higher net score. Rest periods of more than two days retard both speed and accuracy.

Sengbush (375) tried the procedure of presenting drills by lantern slides, presumably to help the student to refrain from looking at the keyboard. There were 42 first-semester pupils and 32 second-semester pupils in the experimental group, and approximately the same number in the control groups. The author reported that in every test the experimental group was ahead, but did not show whether or not the differences were statistically significant.

Kuna (356) believed that teaching the letters from shorthand characters rather than from print might eliminate one or more of the difficulties in teaching transcription. She tried the plan experimentally in her own classes for a year and then tried it in six other schools with 46 students who were starting shorthand and typewriting. All the typing drills were taken from shorthand, written by the students themselves. A transcription test, a keyboard test, and a five-minute copying test were used. At the end of thirty weeks, the experimental group copied about twenty words net a minute and transcripted about fifteen words per minute, which is about as rapid transcription as is ordinarily secured at the end of four semesters. It would be interesting to have this procedure followed for more than one semester.

Parker (367) tried a plan of presenting all drills in word and syllable groups, no individual letter drills being used. A complete set of exercises was constructed and tried out first in the author's school and the following year in six other schools. In each school there were an experimental and a control group. At the end of the semester, the experimental group was slightly ahead in all schools but one.

Nordgren (364) attempted to determine whether the noise from standard typewriters proves to be a detrimental factor, and whether or not students progress more rapidly on noiseless than on standard machines. Three college classes served as subjects, the students being paired for ability by a tapping test, the Hoke Prognostic Test of Stenographic Ability, and intelligence. Tests were given weekly. Results indicated no significant difference in achievement of the two groups.

Several studies of errors have been made. Opfer (366) studied errors made in a copying test by 442 students of first-semester typing, as taken from tests given during the seventeenth week of instruction. She reported an elaborate list of letter errors and non-letter errors, with frequencies for each, which should be valuable for teachers. The test did not cover all the characters on the keyboard, and errors were limited to those observable from papers. Since a student may make a correct copy although using incorrect procedures, the list of errors is probably not complete. Nevertheless, for the types of errors covered, the report is an elaborate and exhaustive one.

Pille (370) tabulated the errors made by 956 eighth- and ninth-grade students of first-semester typing who made net scores of less than ten words a minute in the state tests in California. The errors were classified under four headings: letter errors, word errors, punctuation errors, and manipulation errors. The author reported that there is little difference in either number or variety of errors between eighth- and ninth-grade pupils, but that, as the net rate increases, the percent of word, punctuation, and manipulation errors decreases, while the percent of letter errors increases. The test did not cover all the characters on the keyboard, but the sampling is apparently adequate.

Hawkins (348) analyzed errors in first-, second-, and third-semester classes to determine kinds of errors found in each term, and the persistency of each type. Class exercises were collected for three classes from November to February, each class having about forty pupils. Errors made in tests were tabulated separately from those made in class exercises. Tabulations were made in terms of letter errors, manipulation errors, mental errors, and miscellaneous errors. The conclusions indicated that imperfect location of "e," "i," and "s" persist through the three semesters, as do mental errors such as omission and addition of letters. First-semester classes tend to make errors in spacing between letters and words and in piling. Second-term classes make errors in spacing between letters, and in placement of material. Third-semester classes tend to err in spacing between words, omission of words, placement, business procedures, punctuation, and substitution of words.

Miller (362) attempted to prepare exercises to provide continuous and adequate drill in known tendencies to error. For each of 102 common tendencies to error in striking letter keys, drill exercises were constructed which were given for several days in various words, and then reviewed ac-

cording to a cyclical scheme throughout the term. The procedure was tried out with a class of 35 beginners in high-school typing, and results of 9 tests were compared with those of a control group of 32 who used a standard text. Comparisons were made for 22 matched pairs on a copying test. The experimental group at the end of nine weeks made 130 points, while the control group made 89; after eighteen weeks, the experimental score was 155 and the control score 121; and after thirty-six weeks the experimental group scored 213 and the control group 164. As a result, the author feels that specially planned cyclical practice on known difficulties is much better than the more or less haphazard treatment found in the average textbook. While the number of cases is small, the differences are sufficiently large to give reason for believing her statement that it is better to provide practice to prevent errors instead of waiting until errors develop and then to provide remedial treatment.

Jones (353) set up a series of situations through which he tried to develop the trait of initiative in typing by actual practice in the trait rather than through discussion, hypothetical cases, codes of ethics, and the like, as is commonly done. He tried the procedure with two high-school groups of seventeen each. At the end of the semester an objective test of initiative, constructed by the author, was given to both groups and to a group of 50 stenographers on the job. Results: Control group, 70 points; experimental group, 85 points; stenographers, 80 points. While the number of cases is small, this study provides some carefully controlled statistical evidence of the merits of developing traits by actual exercise.

**Stenography**

Wilson (377) studied the differences in degree of learning shorthand characters of about thirty bright and dull pupils, approximately equally divided between ninth and twelfth grades. A selection involving twenty-six characters was presented for seven practice periods. The exercise consisted of a card bearing the typed material with shorthand outlines for each word. Students were asked to try to learn the shorthand characters so that they could recognize them separately. They were tested by means of cards bearing the shorthand characters only, upon which they were to write the correct longhand words. Results indicated that success was related to size of characters, complexity of characters, and familiarity with symbols almost equally between the two groups. The bright and dull pupils differed in degree rather than in kind, that is, the bright made more correct responses but the types of error did not differ significantly. On the characters most often missed, the bright students did not do better than the dull students. The number of cases is small, but the study seems to indicate that even for character recognition something more than intelligence is involved, and that intelligence alone is insufficient for prognosis.

Brewington (338) made a study of the nature of eye fixations in reading shorthand. She used a group of seventeen college students and another group of eight miscellaneous persons including stenographers, experts, and

teachers. Each was tested by a photographic device which recorded eye movements and fixations. She found that an increase in comprehension decreases the time or duration of fixations; that many more fixations are required in reading shorthand than in longhand, and that many of the findings regarding fixations, regressive movements, and return eye sweeps from reading are applicable to shorthand reading. The number of cases is small so that no norms may be set up, but the study reveals the need for attention to reading habits in shorthand as well as in print or longhand.

Goen (344) studied three groups of college shorthand students to determine the effect of traditional shorthand penmanship drills, of modified shorthand penmanship drills, and no penmanship drills at all. Three small classes were used, the students being paired according to intelligence. Results were measured by transcription ability on two letters taken from the Blackstone-McLaughlin Stenographic Proficiency Tests, by letters taken from the Gregg Speed Building text, by three groups of letters made up largely of brief forms, and by three groups of vocabulary letters dictated at various speeds. Results: The correlation between transcription ability and quality of longhand penmanship was .00. Between transcription and speed of longhand penmanship, the correlation was .31. Between transcription and intelligence, the correlation was .33. No difference could be discerned in achievement as related to type of shorthand penmanship drill. The group which had none did as well as the group which had such drills every day. This study, while small, tends to indicate that too much emphasis may be given to shorthand penmanship drills.

Hubley (351) studied 200 papers taken from Gregg Writer Transcription Tests for May 1931, to determine the types of errors made. She reported that high frequency words show ten times the accuracy of low frequency words and suggested that less time may be spent on high frequency words in favor of those less commonly met. Principles found in the last part of the Manual, such as abbreviating, analogical word endings, and omission of certain vowels and consonants are frequently violated and need additional emphasis to compensate for infrequency of application. Brief forms are accurate if frequently used, but often missed if met rarely. Outlines which were taught in one form and later modified were frequently missed. Continued theory review should be correlated with dictation practice. The study is probably fairly representative and indicates that we may have been providing too much drill on frequent words which would be learned without special drill, and too little drill on infrequent words.

Lauritsen (358) studied the literature dealing with transcription and provided summaries of numerous studies which should be valuable to those interested in this problem.

### Bookkeeping

Cooper (339) studied the results of the statewide every-pupil contest in Wisconsin to determine the relative achievements of double and single

periods in bookkeeping. He revealed that the achievements of the two groups are similar and questions the desirability of using double periods wherein there is 100 percent more use of the teacher's time, the student's time, and use of the school equipment. The study is based upon a wide sampling which is probably adequate.

Kuntz (357) analyzed errors made by 1,595 second-semester students in a large high school. An elaborate list of types of errors was prepared covering journalizing, posting, closing the ledger, the balance sheet, and the profit and loss statement. In each division, a distinction was made between errors of content and errors of form. Results are shown for the seventh week, mid-term, and fifteenth week, so that increases or decreases in errors may be revealed. The findings are very useful in predicting types of errors, although the nature of the tests is not quite clear and nothing is known of their reliability or validity.

Cradit (340) made a list of the advantages and disadvantages claimed for the journal, ledger, and balance sheet methods of approach. While he provides no statistical evidence concerning the claims made, the list is a valuable one.

Piatt (369) studied the merits of the account approach and the journal approach with two groups of 31 and 58 pupils respectively. Three tests were given, the Elwell Fowlkes Test, Form 1a, and two tests constructed by the author, one covering theory and one covering practice. Students were paired for intelligence and according to scores on a preliminary test. Results showed the account approach superior. This is contrary to the findings of Atkinson. Nothing is known of the validity or reliability of the author's tests, and it appears doubtful that the practice test could be scored objectively. However, since the difference appeared significant, it is evident that further experimentation is needed before a final decision as to the merits of the two approaches may be made.

Hartley (347) studied the number of repetitions needed for mastery of the form of certain common business papers such as checks, invoices, receipts, deposits, and statements. In each case instruction was given and followed by the preparation of two or three examples of a given form. These were corrected and further instruction was given until mastery resulted. It was found that the number of repetitions needed was as follows: Checks 11, invoices 9, statements 10, deposit tickets 6, receipts 6, endorsements 5. Only 65 cases were involved. An elaborate checklist of possible types of errors was worked out which would be helpful to a teacher. The results indicated that there has been much useless overlearning in the preparation of numerous business papers in bookkeeping classes.

### Office Practice

Holmdahl (350) reported the results of a questionnaire on methods of office practice in 105 large high schools. No information is provided, however, to show whether such practices are approved ones.

McCall (361) tried to determine the effects upon arithmetical ability of study of the Monroe and the Comptometer calculating machines. The study included 47 twelfth-grade students and 8 junior college freshmen. Each student worked on a machine five periods a week for about six weeks. For tests before and after training, the Kinney Scale and the Stevenson Arithmetic Reading Tests were used. There was no control group. Results showed improvement in certain phases which might or might not have occurred without instruction on the calculating machines. Data were given to show which phases of arithmetic showed greatest improvement from the Monroe and which from the Comptometer.

Roberts (372) set up a series of job instruction sheets for teaching the mimeograph, which apparently cover the subject thoroughly and make it easier to teach the subject without class recitations. No statistical treatment of the effectiveness of the procedure is provided.

**Miscellaneous**

Katenkamp (354) attempted to measure the relative effectiveness of the recitation method and the individual method in junior business training. With a large sampling and a control group equated for ability, no significant difference could be found. The individual method used workbooks, practice tests of self-correcting nature, and each student remained on a unit until it was mastered. After the summer vacation, a test was given to measure retention and again no significant difference was found. The study appears to be adequate.

Breidenbaugh (337) studied improvement in penmanship and spelling among college classes under two methods. There were 109 students divided into two sections. One was taught penmanship by individual instruction and spelling by so-many-words-a-day. The other section studied penmanship by self-diagnosis, with instruction on errors found by students in their own papers, and spelling by the test-study-test plan which appears to mean to study it in any way desired. The groups were tested at the beginning and end of twelve weeks. Both groups made a decided gain in formal handwriting, the greater gain being made by the self-diagnosis group. The self-diagnosis group also made a greater gain in quality of note taking. In spelling, the group that studied a given number of words a day made the greater gain. The study gives a valuable list of types of malformations of letters likely to be found in penmanship.

Henderson (349) attempted to evaluate the effects of practice teaching in typing by giving an elaborate objective test to students of beginning teachers who had no practice teaching, those who had practice teaching in typing, and those who had practice teaching but not in typing. The number of cases was too small to yield dependable results but it was surprising that the teachers with special practice teaching courses in typing got no better results from their students than did the other teachers studied.

# CHAPTER VII

## Industrial and Vocational Education

In a review of industrial education for 1933, Bawden (380) stressed the learning of something through the making of something. This new emphasis upon information and content does not neglect the manipulative activities and skills, but looks upon them as means rather than ends. It goes beyond skill objectives to a recognition of avocational and leisure-time activities; knowledge about industrial products, processes, and occupational opportunities; creative expression and problem solving; and, to a somewhat lesser degree, a bringing to consciousness of individual inclinations, interests, and abilities.

Williams (398), using statements from annual reports, consultations with other regional agents, and his own observation, summarized the trends in methods of teaching agriculture. He interpreted method broadly to include the selection of the training content as well as the ways and means of putting learners in contact with this as desired experience. He pointed out low and high lights rather than attempts to measure progress. He found that a number of states are breaking away from traditional practices in adapting their courses to actual training needs. This report is descriptive and includes straightforward suggestions which should be helpful to teachers of agriculture.

Bowman (382) studied the current policies and practices in teaching blueprint reading in 146 schools to develop principles governing the selection of subjectmatter and method of teaching for five selected building trades and the application of these principles to the problems involved in the preparation of instructional material. He found that the methods and materials of instruction in evening classes must have practical application to hold the continued interest of students. The direct reading method, analogous to the method used in teaching elementary reading, with appropriate modifications, was found most useful in learning blueprint reading. The underlay sketch should be widely employed in the early stages of learning orthographic projection. Meanings of indications are developed through the association of the indication with the name, use, material, source, and other characteristics of the object analyzed.

Hurtuk (389) found that no teaching methods or pedagogical principles apply exclusively to industrial and vocational subjects. He emphasized the importance of tests as a means of measuring progress and of drill as a means of developing speed and accuracy. Carey (383) advocated a middle course between methods designed to stress the extremes of vocational and cultural emphases in the teaching of advertising. He emphasized the use

of the advertising campaign as a practical problem affording great opportunity for initiative within the ability levels of pupils from normal to the brightest. Carlsen (384) presented a plan to enable the teacher to take care of larger classes by the assignment of managerial duties and responsibilities to rotating groups of pupils as an aid in effecting essential core learnings in general shop practice. Goff (388) adapted a differentiated contract plan with testing materials for follow-up purposes to stimulate the maximum attainment of each student in elementary forging. Roberts (393) used an individual instruction method combining small classes in a way that permitted a wide spread of subjectmatter in high-school agriculture with results that showed as high efficiency as group teaching. Dickman (385) found no significant difference between scores of equated groups in the assembly of mechanical things when one group was "teacher-directed activity" and the other a "self-directed activity." He suggested that industrial arts teachers use the method of specific instruction too frequently. Martin (390) determined a 15 percent carry-over of skill to a new project from a previous project in which the trade learner had received recent instructions by means of a series of short demonstrations. The greatest carry-over was found among students of high mechanical aptitude. Differences in intelligence made no appreciable difference in the carry-over of skill.

Twogood and Cramlet (396) used film slides in the teaching of mechanical drawing and found a decided improvement in technic and the appearance of drawings. This increase in quality was accompanied by an increase in quantity as well. The use of films relieved the teacher of much minor routine and enabled pupils to answer their own questions. The increased clarity of instruction had a positive effect upon the interest of pupils in the work. Twogood (397) revised the method and conducted a cooperative study to determine its effectiveness in relation to a non-film slide method with considerable evidence to support the belief that visual devices can be used effectively in industrial arts teaching. Arnold (379) also showed certain advantages of motion pictures in teaching certain phases of shop work. Albertson and Reed (378) found visual methods about 2 percent superior to the non-visual methods immediately after the learning, 4.2 percent superior one week later, and 5.5 percent superior one month later. Thus the amount of superiority increased with the lapse of time after learning. It was found that the amount of superiority of visual methods increases as the learning ability of the students decreases.

Petry (392) interviewed teachers, supervisors, and administrators in the Columbus, Ohio, schools and found that class trips have high educational value, though they are impractical when used on an extensive scale because of the large number of pupils and the limited number of desirable business firms and their reluctance to have visitations in their plants.

Borofka (381) presented experimental evidence in favor of the use of instruction sheets in the teaching of skills, information, and planning ability to students in foundry work. Douglass (386) also presented ex-

perimental evidence as to the value of instruction sheets for bench woodwork classes.

Monks (391) used seven "competent" judges in selecting a scale of seven drawings from a total of 500 pencil drawings of the same problem. He found that they varied greatly in their ability to judge drawings subjectively. Falgren (387) attempted to establish criteria for greater reliability in shop grading with weighted factors and suggested appropriate scales and profiles which were intended also as a means of student motivation. Experimentation gave evidence that systematic grading stimulates achievement.

Schleter (394) found that scores on tests of mechanical ability correlate negatively with ability to make electrical splices. Schmidt (395) has just about completed an observational technic for industrial arts measurement that goes beyond knowledges and skills into the fundamentals of habits, attitudes, and appreciations.

# CHAPTER VIII

## Fine Arts

THE research published recently in the field of the fine arts is devoted largely to comparisons of various tests of art ability and art appreciation, and comparisons of art tests with those of intelligence and personality tests. From these studies, apparently many of the art tests show little relationship to each other or to intelligence or personality tests. Of the tests constructed prior to 1930, those of McAdory (450) and Kline and Carey (429) have been revised by the authors. Meier and Seashore (438) have published a manual for the Meier-Seashore art test.

Bird (400) gave a critical analysis of the majority of the tests and scales in the field of art. He found a slight positive correlation between intelligence as rated by the Goodenough and the Dearborn tests and an art test which consisted of an original drawing, a copy, and a drawing from memory.

Daniels (411), using thirty-seven children, found a low correlation ($.19 \pm .05$) between esthetic discrimination and intelligence as measured by the Binet test.

Wallis (460) reported the following correlations: Lewerenz Art Test and Meier-Seashore Art Judgment Test, .53; Lewerenz Art Test and McAdory Art Test, .58; Meier-Seashore Art Judgment Test and McAdory Art Test, .37. Carroll and Eurich (404) in testing 674 college students found a relation of $.27 \pm .06$ between the Meier-Seashore and the McAdory Tests. Critical ability in art appears to have little or no relationship to abstract intelligence as measured by the Miller Analogy Test, although the extremes in intelligence appear to affect art ability to some extent. Carroll (407) also showed that the ratings of neither the McAdory nor the Meier-Seashore Tests correlate appreciably with ratings of college art instructors or with grades in college art courses.

Kinter (428) gave a summary of recently constructed art tests, several of which are not yet in print. She also summarized the various abilities on which there seems to be a general agreement in art testing. These are: (a) balance and proportion; (b) originality and imagination; (c) visual memory; (d) color values; (e) observation; (f) perspective; and (g) interest and knowledge.

Of the tests that have recently appeared, that of Guilford and Guilford (422) was found by the authors to have reliability correlations of .82 and .70 and validity correlations (based on teachers' ratings) of .65 and .58 for the two groups of college students tested. The test consists of the drawing of simple lines to express feelings implied by given adjectives.

Sterzinger (453) constructed a battery of twelve tests which consist of questionnaires, demonstrations of the use of color, pattern completion, analysis of paintings, and memory of objects. Poor art students were found to differ most from good art students in precision of reproduction from memory.

Bulley (403) designed a test of "good taste" in art consisting of nine pairs of contrasted objects of household use, each pair representing a better and worse example in artistic value. More than 12,000 subjects ranging from small children to adults of various ages, occupations, and educational levels took the test. General education appears to be the largest factor of influence in artistic judgment. Musicians, art teachers, and authors rank somewhat higher than artists.

Differences in artistic ability have been studied in relation to age, sex, play, temperament, and nationality. Knauber (430) reported that in young children with no previous training in art, differences in ability and interest are manifested as young as two years of age. A retest after five weeks' instruction showed a creation of interest and development of talent. Using a test of colored rectangles on 162 subjects, Israeli (425) found that with increasing age there is less variability and more agreement and that there is a qualitative similarity of reaction for all subjects and a quantitative differentiation in central tendency. Jasper (427), in testing 112 children of preschool age for sensitivity to rhythm in graphic form by using simple abstract diagrams, found a correlation of $.69 \pm .036$ between chronological age and design rhythm. No significant relationship was found between design rhythm and either sex or intelligence. Miller (442) compared the recognition of isolated form with age, grade, and sex in 1,014 junior high-school students. Age seemed to have little effect in this type of esthetic judgment. The girls' responses were more accurate, but the boys showed more improvement from grade to grade.

In testing the color preferences of 1,032 young children, Garth and Porter (420) found red to be the color most favored by preschool children. Blue is more often preferred with increasing age. Boys of six years and even younger seem to have better discrimination for color than girls. Staples (451) tested 262 infants from sixty-nine days to two years for color perception. She concluded that color perception begins apparently during the third month and is most marked from the sixth to the twelfth month and that girl infants are somewhat more responsive than boys.

From tests given to 1,116 school children and 100 college students, Zinn (468) concluded that originality in drawing is aided by maturity and experience, that boys appear somewhat more original than girls, and that originality seems to be a special skill.

From the observation of the playground behavior of six artistically superior and five artistically inferior children, Dow (413) found no great difference in behavior on playgrounds without play equipment. Where equipment was provided, the superior children were less social and less physically

active than the inferior children. Tiebout (456) reported that artistically superior children show more complete and accurate observation, better recall of observed material, greater originality in construction of objects from meaningless material, in line drawing, and in discrimination of form and of comparisons. Rodgers (447) observed no significant difference in environment of artistically gifted and non-gifted children, although the environment of the gifted ranked slightly higher as to permanency and both interior and exterior reading advantages.

Whorley (465), studying differences in sensitivity to compositional unity in 100 children, found sensitivity to unity rare in the preschool age, a slight sex difference in favor of the girls, and no relationship between sensitivity to unity and mental age.

Williams (466) found color harmony to be recognized in children as early as the fourth year and to be above chance score after the eighth year. Artistic children do little better than unselected children in color harmony.

Mexican children studied by Stolz and Manuel (454) were shown to rank slightly higher on the Meier-Seashore Art Test than non-Mexican children and slightly lower on the McAdory test than non-Mexican children. Vydra (458) tested elementary-school children of different nationalities for original drawing. He stated that the Slovakian children show the greatest tendency to rhythm, Hungarian children next, and German children last. Jewish and gypsy children displayed little ability.

Using questionnaires to determine the art preferences of 384 girls and 313 boys from junior high schools, Traill and Harap (457) found that drawing and painting ranked first as art process preferences, animals and landscapes as subject preferences, and pencils and crayons as art mediums. In the study of children's interests in pictures, Mellinger (440) showed that 795 children of first-, third-, and fifth-grade levels preferred colored to uncolored pictures and were more interested in realistic than in conventional style.

Gordon's study (421) of imagined color blends in which 103 students in psychology were tested, showed that color predictions were fairly good only when the colors were close in the spectrum.

**Summary**

The researches reviewed here represent a selection from some 115 articles and 40 or more master's and doctor's theses. The reviewer was impressed by the fact that most of the research in art education and methods is being done, not at the high-school and college levels, but in the elementary, primary, and preschool fields. One might go so far as to say that for every careful experiment in art teaching at the secondary and college levels, two equal or superior studies can be found at or below the elementary-school level.

At the secondary and college levels, there are numerous opinionated studies of questionable scientific value. More controlled studies made upon large groups using, whenever possible, standardized tests are greatly needed.

# CHAPTER IX

## Music

THE various surveys of high-school instruction in music, reported in the *Proceedings* of the Music Teachers National Association and the Music Supervisors National Conference (474), and in such journals as *School Music* and the *Music Supervisors Journal*, show increasing and better organized use of class instruction in piano, band, and orchestral instruments. No special change seems to have developed in the utilization of the radio during school hours. In Boston more unusual opportunities are offered the children to broadcast for themselves, and in California, students may listen to a radio lecture in preparation for the current symphony concerts given to the general public. In neither case is a check-up or measurable progress reported. Gordon (471) summarized the results of his combination of phonograph and radio instruction for teaching singing in the rural schools of Wisconsin. Follow-up supervisory visits, and testing by the Gildersleeve Harrison tests demonstrated the efficiency of his method. Adults in rural communities are assisted by the further device of criticism of their own group singing, as recorded phonographically, and by comparison by them with an example of good singing recorded on the reverse side of the disk when returned by the instructor.

Arnspiger (469), using seventh-grade pupils in five cities, checked the use of sound motion pictures for teaching about the symphony orchestra and its instruments. The immediate results favored the picture method, but the control group, taught by ordinary methods, did better in a retention test a month later. As the control group measured somewhat higher in intelligence and in the initial information test, its superiority may be thus accounted for. Hughes's study (472), besides its historical outline, is valuable chiefly for its exhaustive listing of works suitable for the teaching of chamber music in secondary schools. It contains good advice on the aims and methods of conducting such classes.

Wolner and Pyle (483) reported an experiment in training pitch deficient children. Twenty-one cases were selected from three Detroit schools, on the bases of inability to learn to sing after at least five years of instruction by the usual methods, and lack of pitch discrimination. They were given an average of sixteen hours individual training in twenty-minute daily periods, at the end of which all had learned, though unequally well, to sing the scale and some intervals, with the piano. Four could discriminate pitch differences as fine as ½ d.v. The conclusion is that no previous structural ear defect existed. Questions concerning former teaching methods are not dealt with. If we are to avoid an inferiority complex from the suggestion of inability to sing in tune, then early diagnosis and demonstrably efficient correction should be in order.

Ortmann (479) analyzed and graded for difficulty types of melody to be memorized. His results are in agreement with what we know of the historic development of melody, and with experience in teaching little children to sing. His college-age subjects found step-wise progression easier than wide skips. Whitely (482) offered suggestions on the abuse of the radio in the home, showing the detrimental effect on learning verbal material while music, especially song, was being rendered. However, music listened to attentively before such learning could arouse certain moods which might then facilitate learning.

Kwalwasser (473), using the K-D tests, found girls exceeding boys in total score in all grades except the fifth. The Wheelers (481), using the Seashore tests, found the upper grade children of mountain schools in east Tennessee markedly below the norm in pitch discrimination and in tonal memory. They suggested, as partial explanation, that a fixed pitch is not learned early by these rural children from any common experience with keyboard instruments. However, since the correlation between these two tests is only moderately high and they are somewhat related to intelligence, another explanation may be the correct one. Compared with Larsen's earlier results of testing eighth-grade beginners in music, Gray and Bingham's with Negroes, and Garth's with Indians, the mountain children were superior. Sanderson (480), using the Seashore pitch, intensity and memory, and the K-D battery on approximately 100 children of five different national origins, all in the eighth grade, found Jewish children scoring highest, German next, Italians generally third, Polish and Negro lower, except that the Negroes excelled in rhythm discrimination. This confirms some of Streep's earlier work with 1,300 younger children, where Negroes proved superior to white in both rhythm and consonance. Merrifield (476), with 340 subjects, found Negroes on the junior high-school level more variable on all the K-D tests, with no reliable superiority in any one test. His non-Jewish white subjects ranked higher than the Jewish group.

An attempt by McAdam (475) to measure development of musical taste in eighth-grade children seems to have been carefully done, but inadequately described. The chief need here is for a standardized test of music appreciation, towards which she appears to be working. More (477), testing college entrants, found the Seashore pitch test correlating highest with later "marks" in course. Mosher and Otterstein (478) placed more reliance on a combined test score, including their own sight singing test. They stated that the Iowa High School Content Examination correlated higher with grades received in music in the first quarter at college than did the music tests themselves. It is open to proof whether this is due to faulty music tests or to instructors' general methods of marking. Farnsworth's detailed comparative studies (470) of available phonographic tests result in grade norms for the K-D and a corroboration of the superiority of the Seashore tests for reliability. Consequently, the recommendation is to use the K-D for group survey purposes only.

# CHAPTER X

## Health and Physical Education

THE researches reviewed have been selected from a total of approximately fifty studies. Readers interested in a more extensive bibliography should consult reference no. 484.

### Research Studies without Direct Reference to Teaching

Cooper (489), rejecting the commonly used basis of school grades for establishing of comparative scholarship of athletes and non-athletes, secured data on 4,500 students in Pennsylvania colleges in 1927 and 1928. He used the scores of freshmen on various intelligence tests compared with the scores made by the same students as seniors on the Carnegie Foundation Achievement Tests. These students were grouped into athletes and non-athletes, the latter again subdivided into extracurriculum and non-extracurriculum men. The procedure in handling of raw data consisted of pairing each athlete with a non-athlete from the same institution on the basis that the scores on the intelligence tests be within eight points of each other. The statistical details used are given in formulas and tables. Among the conclusions may be noted the following: the non-athletic groups showed a slight superiority in achievement, a greater variability and a higher correlation between intelligence test scores and achievement test scores than did the athletes. Yet the author observes that "due to the great variation of institutional findings, the conclusions of this study are of no value in predicting the relationship of athletics and scholarship in an institution."

Perry (506) used athletes on the varsity football, basketball, baseball, and track teams of four high schools (grades ten to twelve) in San Diego, California, a total of 400 subjects. The measures considered were (a) mental age, (b) life age, (c) intelligence quotient, and (d) average grade point per unit (honor points). Some of the results follow, all data being expressed as means:

| Group | Mean Mental Age | Mean Chronological Age | Mean I. Q. | Mean Honor Point Ratio |
|---|---|---|---|---|
| Football | 16.3 | 18.4 | 102.4 | 1.335 |
| Basketball | 16.7 | 18.0 | 102.8 | 1.415 |
| Baseball | 16.0 | 18.5 | 100.1 | 1.230 |
| Track | 16.7 | 18.3 | 103.2 | 1.415 |
| Non-athletes | 16.3 | 18.0 | 102.1 | 0.825 |

Among the interpretations offered by the author are: the athletes had a higher I. Q., were more mature, more capable mentally, had better academic achievement, which latter measure he regards as the most significant of those studied. The academic superiority of athletes may be ascribed not to

maturity nor mental ability, but to participation in athletics with its requirement of eligibility for participation.

By a series of metabolic tests upon two regular and two substitute players of the football squad at the University of Southern California, Baldwin and Shaw (486) found that during a playing season active metabolism increased during the period of preparation for the critical games. Substitutes showed an increase but less than that of the regular players. Emotional disturbances as the schedule advanced to the more important games are suggested as causal factors.

To secure experimental evidence on the influence of athletics on character traits, Hackenberg and associates (497) used three high schools in Pennsylvania. In one school forty pupils in each of three groups, namely, (a) active athletes; (b) those interested but not participating; and (c) those neither participating nor interested, were measured at the beginning and near the end of the school year, to test for honesty, citizenship, obedience, and sportsmanship. The procedure employed the three character educational inquiry tests, the O'Reilly character analysis chart, and the New York rating scale for school habits. Statistical interpretation of results showed for group 1, a gain of 1.55; for group 2, 0.06; and for group 3, a gain of 0.9. In the other two schools the procedure consisted of teacher ratings and so was not comparable with the above results. But the general findings showed that out of eight possible comparisons, four were in favor of the athletes and four of the non-athletes. The author offered the general conclusion that these experiments suggest "the mere possibility that athletics may be made to contribute slightly to the development of character traits, but also that the contribution is much smaller than is often alleged to be."

Wilson (512) investigated velocity tests as a method of checking up on the relative efficiency of arms and legs in the sixty-yard crawl stroke. Arm speed alone correlated with whole speed .833 $\pm$ .026. Leg speed alone showed a correlation of .697 $\pm$.044. He then treated his data statistically, deriving a prediction equation as follows: whole speed = .343 arm speed + .106 leg speed + 5.16. (Substitute seconds required to swim sixty feet at top speed with arms alone, also with legs alone, multiply by the coefficients and add the constant directly.) In 132 cases tested, this prediction has an average accuracy of 92.8 percent. Formulas are also submitted for the back crawl and the breast strokes.

Warner (511) sought during a season in a girls' camp of thirty-eight campers and thirteen counsellors, ages nine to thirty years, to secure evidence of the result of training on cardio-vascular rating (Schneider's test) and also the effect of certain athletic activities on organic vigor, blood pressure and pulse rate. Conclusions based on data secured are: the pulse decreased; heart rate returned more rapidly to normal after exercise; systolic pressure rose on change from the horizontal to the vertical position, instead of a systolic drop at the beginning of the camp; pulse pressure was also increased.

Rowe (508) recorded certain physical gains of junior high-school boys in relation to their physical activity. The first experiment consisted of records during the fall season between September 1 and December 1, but inasmuch as these were regarded as rather unreliable, more refined methods were adopted with the following gross results:

| Group | Period | Weight | Height | Lung Capacity |
|---|---|---|---|---|
| Non-athletes | 3 years | +30.85 pounds | +3.79 inches | +54.5 units |
| Athletes | 3 years | +23.70 pounds | +1.85 inches | +37.9 units |

The unit of measurement for lung capacity is not stated. The average age of the athletes was sixteen years and eight months, while that for the non-athletes was fifteen years and eight months (rather advanced ages for junior high-school boys). Instead of an interpretation or definite conclusions the author submitted a series of eight questions stimulative of further study.

Securing the opinions of about 2,400 men entering Pennsylvania State College upon their activity interests among the seventeen forms offered, Davis (493) submitted information useful in guidance as to program content. Basketball and playground ball were the most popular, while heavy apparatus, calisthenics, and marching were the least desired. Additional instruction was sought chiefly in boxing, basketball, handball, wrestling, and playground ball. A decidedly strong preference (91 percent) was expressed for games and sports. Attention is called to the degree of correspondence between these findings and the report of the Committee on Curriculum Research of the Society of Directors of Physical Education in Colleges.

Thisted (510) undertook the task of measuring objectively the relationship between participation in college athletics and vocational success. Using those in the University of Iowa of the classes of 1905-25 inclusive, who were awarded an athletic letter, as representing the athletes and a complicated standard for determining success, the author secured information on 501 alumni. Eleven detailed conclusions were stated, but there is no claim made for causal relation between athletic participation and later success. The general opinion was expressed, however, to the effect that students participating in intercollegiate athletics show no evidence of having been handicapped by their athletic participation either while in college or in later vocational life.

### Methods of Teaching

Cozens (491), using well over 100 students in the fall of 1931, recorded improvement and plotted learning curves for six track events. Among his findings are: (a) practice in one event will contribute additional skill in such other events as contain identical elements; (b) observation does not aid in acquiring skill for "we learn to do by doing"; and (c) learning curves in "big muscle" events follow the same outline as curves involving mental reactions or small muscle groups.

A study of high-school girls not only in their preference in activities, but also in methods of conducting classes is reported by Driftmier (494). The self-directed program of activities was voted the desirable method at the outset, but experience resulted in a swing to teacher direction. In the list of twenty-six activities or groups of activities, rhythms proved by far the most popular, with basketball and tennis the next in order. Correspondences are noted between the activity preferred and such physical characteristics as motor ability, weight, height, and hip-height ratio.

Hughes (499) reported an experiment undertaken in the attempt to interest all high-school pupils in physical activities. The following is the plan: provide adequate equipment for such games as pupils desire to play; group pupils on basis of games selected; have each group elect the proper number of captains to choose up teams; have each teacher elect and become director of the game he prefers; regroup pupils at frequent intervals; have no scores posted; allow pupils to play for joy of participation. This plan of free play is a decided success in the high school where it has been tried.

Mueller (504) claimed that physical educators are pioneers in ability grouping, having practiced it for more than fifty years as a method of individualization, development, and equal competition. The basis of grouping is the mastery of work units or skills which are easily measured and which constitute parts of group activities. Adequate equipment and time allotment, also trained personnel and suitable clothing are admittedly essential.

McCristal (503), in the attempt to secure certain information concerning rhythm, recorded data on three questions, namely: (a) May rhythm, like form, be acquired through practice, or is it innate? (b) How best can rhythm of pace habit be acquired? (c) How are different types of dancing related to progress in acquiring rhythm or pace habits? The conclusions reached indicate (a) that rhythm is not an innate faculty; (b) that the speed with which rhythm may be learned depends upon the intensity and length of practice periods, and the nature of the movements practiced; and (c) that dances with simple rhythm increase foot rhythm more rapidly than dances with complicated rhythms. During the investigation, the author created and standardized a method of measuring variation in the rate at which a simple muscular movement may be executed.

# CHAPTER XI

## Moral and Character Education

DIRECT versus indirect instruction for character education continues to receive much attention. A series of experiments on this problem was reported by Peters (567). The results show indirect and incidental instruction to be ineffectual in changing conduct measurably. Conversely, the twenty-six out of thirty measures of systematic direct instruction favored this method. In all of these investigations matched groups were used, and even though some of the experimental groups were small and most of the differences were small, the consistency with which they favor direct instruction indicates more than a chance difference. Eichler and Merrill (532) gave short courses in training for social leadership, comparing the results with other groups not similarly trained. No statistically significant differences were found, but the consistency of the direction of the differences indicated the probability that qualities of social leadership can be measurably improved by direct instruction. Meek (557) obtained results which suggest the possibilities of developing international-mindedness when stressed in connection with Latin. Campbell and Stover (519) concluded that international and interracial attitudes could be influenced by direct instruction. Important to the question of direct teaching was the further conclusion that functions occupying the center of attention gain more from teaching than those on the margin of attention. Hackenberg and others (541) found that athletics had little, if any, influence in developing fellowship, followership, obedience, and honesty.

Gladfelter (538) found that courtesy, cooperation, and dependability taught directly to seventh- and eighth-grade pupils had a carry-over effect to the home situation, but teachers reported little improvement in the school situation. Thompson (580) found that 17.7 percent more subjects became more honest under direct instruction than in the control group. Also, 12.4 percent fewer subjects became more deceptive than in the control group. Mawson (555) found a small difference in favor of definite instruction in honesty behavior. Feder and Miller (534) evaluated the results of a program of indirect character education which purported to instil certain character traits. They concluded that the claims made for this program could not be substantiated. The pupils receiving the training were not superior to an untrained group in knowledge of citizenship fundamentals, general behavior, school work, attitudes of superiority or inferiority, health habits or practices, or attitudes disapproving war.

Experimenters are still interested in the relation of conduct, and knowledge and judgment about conduct. Patterson's study (564) assumed that foresight, judged by the ability to foresee a number of consequences and

the probabilities of their occurrence and importance in a course of action, is an important element of character and a significant index of character itself. There was little relation, however, between the ability to foresee the consequences of conduct, and desirable behavior in situations calling for moral conduct. Such relationships may exist for those scoring high consistently on foresight tests. A definite relationship existed between foresight and general reputation as measured by the best standards available. There was a correlation of foresight with intelligence but not with age, thus indicating that individual experiences, plus intelligence, differentiate the ability to foresee. Girls are superior to boys in this ability. Hobson (543) attempted to measure the gap between moral standards of pupils and the conduct they asserted they would follow in specific honesty situations. Knowledge of moral conduct, without instruction, was on the average within 84 percent of the ideal. Answers as to probable conduct indicated that their conduct would fall 29 percent short of their knowledge. Pupils of higher mental age did not have a better understanding of honesty reactions than pupils of lower mental age. After giving instruction in honesty situations, the correlation of the gain in score on test with mental age was .27 $\pm$ .05. Pupils of lower mental age profited by instruction almost as much as pupils of higher mental age. Carter (521), studying 300 children, found at age twelve the most important conflicts were due to personal desire running counter to the ideals of loyalty, helpfulness, truthfulness, dependability, and obedience. At age fourteen these ideals remained the most important, but they then conflicted with desires aroused from group and social contacts. There seemed to be little difference in the complexity of moral situations from age level to age level. The moral level of pupils advances slowly with years. Leal (548), using about 4,000 children, studied the degree to which they exhibited seventeen different traits at each of three stages of physiological maturity. She concluded that the child was a different person as he passed from one stage of maturity to another.

The movies were found potent agents in character development in the Payne Fund studies. These are probably the most complete and thorough studies in the field of character education since the Hartshorne and May investigations of 1929 and 1930. The movie is shown to be a powerful force in adding glamor to criminal behavior. Children remember from 50 to 75 percent as much from pictures as do adults. Many delinquent boys and girls attributed their misfortunes in part to the movies, where they learned extensive crime technics. It is impossible to summarize these important and carefully executed studies adequately here. For a popular summary of these investigations see Forman (536). The technical reports are cited in the bibliography (516, 517, 522, 524, 526, 527, 531, 568, and 569). Shorter technical accounts are found in the *Journal of Educational Sociology* for December, 1932 (523, 525, 528, 542, 566, 570, 572, 573, 574, and 577). Koelle (547) concluded that motion picture advertising appeals particularly to persons of lower intelligence. The pictures used in adver-

tising are chiefly those suggestive of strong passions or involving erotic appetites.

The strength of motives in influencing conduct is still the subject for considerable interest and inquiry. Maller (551) found that 215 children in grades seven and eight were more deceptive when working for themselves than when working for their group. When there was no chance to improve the score of the group through cheating, there was a positive correlation between cooperation and honesty, but when cheating would permit an improvement of the group score, there was a negative correlation. Forlano (535) found that sex competition at age eleven to twelve was a distinctly stronger motive in securing achievement than personal gain. The motive of personal gain was stronger than motivation coming from class or team competition. Williams (585) using opinionnaires, found boys slightly more radical than girls, and college students a little more radical than high-school students. Radical or conservative attitudes seemed to make little difference in leadership, friendship, or popularity. The majority of high-school students preferred to be known as radicals, but were not ashamed of conservatism.

After a period of uncritical use of character ratings, teachers are at last questioning the value of the wholesale ratings of character traits. Greenawalt (540) used character adjustment charts to rate pupils on certain adjustments. She found that the teachers tended to rate as maladjustments traits which were the results of the child's conflicts with the rules of the school, and which indicated how well they got along with the pupil. In a rerating, the judgments of the teachers were found to vary so widely that Greenawalt concluded they cannot be depended upon. Evans (533), studying the secondary schools of Tennessee, found the most commonly provided incentives for character development were honor rolls and character grades. Willis (586) found that students scored higher on attitude and moral judgment situations commonly found in school than on those of the home. Sorenson (576) studied over 600 junior high-school pupils to determine the significance of six factors in predicting certain phases of pupil behavior. He found that behavior ratings ranked next to intelligence as a factor in predicting academic success and seemed to have a general significance about as great as any of the other factors studied.

The research done in character education during the past three years comes more nearly to grips with important problems and is much more objective than previous work. The Hartshorne and May studies stimulated objectivity by demonstrating that behavior is the function of a specific situation. Their conclusions which suggested the need for direct instruction, and methods to insure right conduct as well as knowledge have been the questions which have received experimental study in the past three years.

# CHAPTER XII

## Home Economics

RESEARCH dealing with the methods employed in teaching home economics at either the secondary or the college level has been limited, and published articles have been confined largely to reports of service studies dealing with small groups. Furthermore, there has been little effort to control conditions and the conclusions are largely expressions of subjective judgments. Typical of such studies are the following, which deal with various modifications of the individual assignment method at the secondary level: Forrest (592), Robinson (602), Sell (604), and Skinner (606). It is worth noting that when Sell (605) attempted to measure objectively the effectiveness of this method in contrast with the usual class method of instruction, she modified her conclusions considerably and decided that for a below-average group of ninth-grade girls who had a definite reading handicap, the usual method was the more satisfactory. Later, Sell (603) used a somewhat similar method in teaching related science to a junior high-school class, and while this was not a controlled experiment, the results seem to indicate that the method brought about the desirable learning on the part of the pupils.

Several unpublished master's theses have dealt with the problem method; but few of those which found it to be superior to other methods were carried on with sufficient care or showed statistical treatment of the data that seemed to warrant the conclusions drawn. Hindman (595) described such a study on the college level in which she decided that it was possible to use the problem method effectively, as measured by student reaction toward the instruction, and the amount of information learned which would presumably be used in larger consumer purchasing. Lloyd (596) on the other hand, in what appears to be a rather careful investigation comparing two high-school foods classes, decided that there was little, if any, difference in the relative effectiveness of the problem method and the usual method.

Blake (588) in the bulletin *The Home Project in Homemaking Education* sets up criteria for evaluating this important supplement to classroom instruction and cites specific results of such work. While the treatment is subjective, the evidence of the value of home project work is very convincing. Hatcher's description (594) of the tangible results of home project work in a Missouri town included no statistical data, but recorded with case study technic the effect on the home and the community. Carter (589) enumerated the changes that took place in the types of home project work offered in connection with vocational departments of home economics and in the number of students participating in the work. She failed, however, to give the data any statistical treatment and the thesis is nothing more than

a detailed descriptive summary of the development of the home project program.

Amidon (587) and Fallgatter (591) while making no attempt to report research projects in the fields of related science and art, did include a great deal of valuable material on the methods of teaching such content.

McGinnis and Keever (599) in a survey of the child development work offered in the state-aided secondary schools of Minnesota, concluded that the most effective teaching was done when the students had opportunities for observation and actual contact with preschool children. Robinette (601) described how such contacts are provided in a city high school, and explained how the program provided for parent cooperation, long-time studies of children, and the utilization of other agencies that aid students in making their own social and emotional adjustments.

Hanson (593) in a study of children's use of money, involving ninety cases in grades five to twelve, had children fill out a questionnaire during school hours and selected a sampling of the group for detailed study through informal interviews. She reached certain conclusions that are of import to all those interested in developing a concept of the place of money in the social system, namely, that if children are to learn to spend money wisely, they must be given definite responsibilities in the spending of it and such expenditures should be made under wise guidance.

Nofsker (600) made a very comprehensive study, which included many aspects of home economics education but, unfortunately, was quite subjective in treatment. She concluded that there was great need for improved methods of teaching, especially with respect to the adaptation of the work to the needs and abilities of the students; that there should be a more psychological organization of content; and that greater consideration should be given to effective methods of presenting this work to boys as well as to girls.

Martin and Davison (598) described a three-year experiment in health education in which the cafeteria manager, the National Dairy Council, and an organization of faculty and students cooperated. The effectiveness of the program was shown by a comparison with the results obtained with a control group.

Comley (590) found that in an eighth-grade class which had had laboratory work in foods in the seventh grade, it was possible to substitute demonstrations for laboratory work in reviewing food preparation preliminary to the actual preparation of luncheons. There was a saving of 40 percent in the cost of supplies and the students in the demonstration class apparently learned as much as did the other group, as measured by a test of information and knowledge of its application (reliability of .80); they did equally well in the preparation of the meals, as measured by a very detailed objective checklist; and their ratings on management were so much higher than those of the control group as to suggest the prob-

ability that the demonstration method is more effective than the laboratory method in developing management ability in junior high-school girls.

Maclary (597) summarized the data regarding home economics collected by means of the questionnaires sent out by the United States Office of Education in the National Survey of the Education of Teachers. She found that the home economics courses included more laboratory work than did other courses (the difference being 5.4 times the standard error); that home economics teachers tended to use more of such procedures as excursions, exhibits, and demonstrations, and fewer lectures, discussions, and term papers; and that they tended to give assignments in references rather than in textbooks.

**Summary**

Relatively few home economics education studies have been made in the field of methods of teaching. Many of those reported deal chiefly with other aspects and only a small portion of the content relates to methods (587, 588, 589, 591, 597, 598, 599, 600, and 601). Most of the investigations that do relate specifically to methods are scarcely more than service studies which express the writer's personal reactions and the conclusions are not based upon objective data—at least few such data are included. It is evident that those who are attempting to make investigations in this field need to understand better the requirements of experimental procedures and to be able to select and to use appropriate statistical technics in the interpretation of their findings.

# CHAPTER XIII

## Education, Psychology, and Professional Training

MANY of the problems of teacher preparation have been covered in other numbers of the *Review of Educational Research* including prediction of success, selection and organization of curriculum materials, marks and examinations, construction and validation of standardized and new-type tests, classification and grouping of students, and administrative plans and adjustments. Certain of these topics have psychological and methodological implications, but will not be treated in the present chapter in order to avoid overlapping and to conserve space.

### Student Interests, Preferences, and Study Habits

*Reactions to curriculum materials*—Hartmann (619) and Lick (623) measured the relative interest value of representative items taught in elementary psychology by presenting to 400 undergraduate students at the Pennsylvania State College a list of 256 statements compiled from five textbooks in psychology. Hartmann and Hamm (620) made a similar study in the field of educational psychology in which 234 items were submitted to more than 300 students in five Pennsylvania colleges, involving seven classes in educational psychology. The results confirm the earlier studies in that intelligence and sex are negligible factors in affecting pleasure derived from psychology. Taylor (639) investigated students' reactions to a course in abnormal psychology by means of a questionnaire distributed to 125 members of the class over a three-year period. Van Tuyl and Eurich (645) included in their study of the interests of college students a group with school administration as a major subject.

*Reactions to methods of instruction*—Israeli (622) obtained from two groups of students, numbering sixty-six and thirty-eight and composed mostly of sophomores, preferences with respect to different parts of lectures in general psychology. Demonstrations were considered most interesting and textbook material least interesting, while non-textbook material rated higher than the text. Sperle (636) secured from 164 seniors and from faculty members at New Jersey Teachers College a questionnaire reaction to the merits of a case method of teacher training with which they had been working.

*Reactions to methods of testing*—Stumpf (637) using five college classes in education with a total of 7,363 reactions to true-false statements, found that students did as well by having the statements read to them as by reading for themselves, and that performance as a result of the listening procedure had a more marked relationship to potential ability, although student preference favored reading rather than listening. Eurich

(613) reported that in statistics and educational-psychology classes multiple-choice and true-false tests were preferred to essay and completion tests. Tallmadge and Douglass (638) found that in an education class forty-three students preferred objective tests, while twenty-six were in favor of subjective tests.

*Reactions to teacher qualifications*—McDonald (627) secured from 320 teacher-training students reactions to the qualities and practices of their teachers. The qualities approved were: sense of humor, justice, consideration, friendliness, good voice and address, and attractive personal appearance. The practices approved were: good procedure in making assignments and testing, well-organized classroom work, good discipline, and variety in procedure.

*Study habits*—Bell (607) reported that 127 students in general and educational psychology who kept a detailed record of their study procedures over a period of twenty-eight days, in terms of percents, distributed their time as follows: reading texts, 63; outside reading, 19; working problems, 8.5; and writing themes and papers, 9.5; reading total, 82; writing total, 18. Douglass and Tallmadge (612) by means of a questionnaire reaction from 316 students, and Terry (640) with 236 students in educational psychology, found that the objective type of test focuses the attention of the student upon details and exact wording of passages, while the subjective or essay type seems to stimulate methods of preparation involving organizing, large units, perceiving of relationships and trends, and personal reactions. Terry (641) reported that the majority of 135 students in five psychology classes studied differently, even in preparation for different types of objective tests, which in this instance were the listing-recall, completion, and true-false forms.

## Classroom Procedure and Methods of Instruction

*Lecture methods compared with other types of presentation*—Remmers (630) evaluated three methods of instruction as follows: (a) lecture-recitation, with two lectures per week for groups between 150 and 170 students, and one recitation per week with the large group broken into four separate classes; (b) small recitation groups of from thirty-five to forty students meeting three times per week; and (c) a large lecture group of 125 students meeting three times a week for lectures only. The experiments involved a total of 1,134 students in elementary psychology with 584 paired on the basis of qualitative and quantitative criteria, ten measures of average learning achievement, seven measures of achievement of the upper and lower 20 percent, student attitude, and retention at intervals of one semester and one year. Under the lecture-recitation plan, average learning achievement tended to be somewhat higher and retention more permanent than under the small-group recitation procedure, although student attitudes tended to favor the latter. Lectures three times a week were approximately as effective, in terms of learning achievement, as the lecture-recitation plan, and slightly more so than the small-

group recitation. Longstaff (624) reached essentially the same conclusions as Remmers, on points where the procedures are comparable, with 990 students in lecture-quiz groups and 750 in lecture groups. No statistically significant differences were found between the two methods, in terms of achievement in introductory general psychology, although the students tended to favor methods involving large lecture sections rather than small sections taught by a lecture-discussion method.

Greene (615) reported that, for 648 students in elementary psychology, the results of guided reading (involving the reading of test questions, then a search for the answers) were "very superior" to either the lecture or to unguided reading. Gaskill (614) divided 130 psychology students into two groups on the basis of scholarship, intelligence, and familiarity with the voice and style of the speaker, one group to listen at the broadcasting studio, with the other to hear the talk over radio sets, and discovered a "small but significant" superiority for the radio-listening group. On the basis of data secured from 226 teacher-training institutions, Roberts (631) discovered that the first course in educational psychology is taught by class discussion, lecture, and question and answer methods. Tyler and others (644), in a descriptive account of uncontrolled comparisons between 850 students in laboratory and 4,518 in lecture sections in elementary psychology, reported a slight superiority in the final marks of the students in the laboratory sections. The laboratory sections met three days per week for regular classroom work and two days for laboratory work, while the lecture sections met five days per week for classroom work.

*Project, problem, and independent-study plans*—Shirley and Hevner (634), with 226 students in six laboratory-psychology classes, reported that, as measured by an ordinary objective examination, students learned as much by the project method as by an "ordinary routine" procedure and derived as much interest and satisfaction from the work. The project method was found much better for the student of above average ability who found the routine of ordinary laboratory work distasteful, and for those who liked original work. Cooke (609), with eighteen subjects in educational statistics divided into three sections on the basis of intelligence and previous experience with statistics, although recognizing limitations in terms of the number of cases and control of the time factor, concluded that the combination group (time divided evenly between reading statistical literature and working problems) had slightly better results than either the reading or problems group. Hartmann (618), with two groups each in elementary and educational psychology, in an effort to determine the merits of two versus three class meetings per week, found no statistically significant differences in the results of the achievement tests administered. Ryan's comparison (632) of class instruction with independent study, involving seventy education students, showed that those who attended class made higher achievement scores. They, however, devoted

considerably more time to the subject. With time equated, independent study was considered advantageous.

*Student teaching and observation*—Marshall (625), using three groups of thirty-one teachers each, concluded that in terms of pupil accomplishment and supervisors' judgments, student teaching distributed over a relatively long period of time (more than one term) is superior to a concentrated period of approximately six weeks and to a smaller amount of actual teaching, emphasizing directed observation. In a descriptive account of a rather loosely controlled one-group experiment, Hall (617) showed the gains made by a group of twenty-five students during five weeks of directed observation as compared with an earlier period of the same length involving undirected observation.

*Method in relation to study procedures*—Shipley (633), using thirteen classes, a total of 383 education students, found that the experimental groups (which had either one or two general class-discussion periods per week, the remaining periods being devoted to small-group discussions and directed study), were at least equal in accomplishment to the control classes (which had three general class-discussion periods per week). Parker (629) found specific study material, in connection with a basic textbook entitled *Introduction to Education*, to be valuable even when its use was made voluntary, and to be more helpful to the middle group of students than to the very superior or very inferior.

**Testing and Measurement Procedures in Relation to Motivation and Learning**

*Testing procedures in relation to learning*—Terry (642) concluded that a problem test distributed in advance to an experimental group of students, as a type of motivation in reviewing a given unit in educational psychology, promoted helpful study habits and professionally valuable attitudes in the case of many students. In addition, there was as great gain in informational learning as was secured from the control groups which did not know the nature of the test before the time of examination.

Turney (643), using two groups of forty, and twenty-eight students, equated on the basis of a mental test, with the experimental group scoring lower on an initial subjectmatter test in psychology, found that frequent testing (twelve short quizzes in addition to the mid-semester and final examinations) enabled the experimental group to overcome its initial handicap and to equal the achievement of the control group. The author recognized the limitations of the study in terms of the small number of cases, difficulty in keeping content and method constant, and the impossibility of determining definitely the importance of the gain made. Smeltzer (635), with seven instructors, nineteen classes, and 523 students in educational psychology organized experimental groups whose work was divided into weekly units accompanied by an objective test. For good performance on the test, a holiday was granted, while weak students were given review and extra work. The control groups had informal lectures

and discussions, all students attended five days per week, and units were not so definitely organized. The superiority of the experimental procedure suggests that the passing point could be raised more than one-fourth and still have the same number of students receive credit for the course. McClusky (626) concluded that, for an experimental group of forty-two students in educational psychology, preparation of a paper covering one-half of the course was as effective in terms of a new-type examination administered without previous notice, as was direct preparation for the same test made by a control group of thirty-eight students.

*Analysis of errors in relation to learning*—Hertzberg (621) found experimental groups in educational psychology, to which he had returned their objective tests as study aids in correcting errors, superior in achievement to control groups that did not have such study aids. This review of the tests, however, did not improve delayed recall as measured by the final examination. Deal (610) concluded that nine freshman-sophomore classes in education, which met once a week for at least one hour, in which drill tests in reading and remedial instruction were provided, showed a median percent of gain in reading comprehension of more than 100, while virtually no gain was recorded for three control groups. Dolch (611) applied the principle of mastery to problems of a course in educational psychology by requiring students to prepare papers explaining the psychology involved, with illustrations from school experience. Unsatisfactory papers had to be rewritten as many times as necessary. Brown (608), on the basis of analyses of statistics textbooks and student difficulties, suggested that the teaching of beginning statistics may be improved through remedial instruction for students weak in the elements of arithmetic and algebra and through the postponement until a later course of certain of the more difficult mathematical concepts.

*Retention of information*—Greene (616) repeated for 525 students in psychology during October the examination which they took the preceding June, while Meltzer and Bailor (628) investigated the extent and nature of students' knowledge of psychology before and after the first course.

## Professional Education Other Than Teacher Training

Limitations of space, the interests of readers of the *Review of Educational Research*, and the limited amount of activity in such fields as law, medicine, and engineering, dealing in an objective and controlled way with problems of methodology and learning, render it undesirable to attempt a summary of the investigational literature in these areas. However, a brief general statement may be made concerning certain studies. The Carnegie Foundation for the Advancement of Teaching and the United States Office of Education have issued numerous reports dealing with a variety of problems in the fields of law, medicine, engineering, and dentistry. The Rockefeller Foundation and the White House Conference on Child Health and Protection recently have published studies of espe-

cial significance in medical education. The Society for the Promotion of Engineering Education has had available for several years its comprehensive investigation of engineering education. A thorough study of the dental curriculum has been in progress for several years under the sponsorship of the American Association of Dental Schools. It will be recognized that these surveys and reports deal only in part with problems of methodology and the psychology of learning.

**Conclusions and Evaluations**

While student interests and preferences are subjective reactions of rather immature individuals, usually in the form of a questionnaire canvass of opinion, and as such should not be considered necessarily valid or final evaluations of teaching procedure, it is of vital importance in the facilitation of learning situations that teachers and administrators know student attitudes, whether right or wrong, especially the latter. When the student's mental attitude toward teacher, subjectmatter, methods of instruction, or measurement of results is wrong or irrational, the need for correcting the situation is obvious.

Apparently the lecture method in large groups is proving as effective in college, in terms of the measures used, as more informal discussion and recitation procedures in small groups. This conclusion may seem to contradict other studies which report good results from procedures involving student activity and participation in the form of project, problem, and individualized or independent-study plans when compared with more nearly routine methods of instruction including regular class attendance, definitely assigned readings, discussions, etc. However, it is not to be assumed that a lecture delivered before a large group necessarily involves a minimum of student activity on the part of the listeners; on the contrary, a good speaker may have just the opposite effect in stimulating the mental reaction of his audience. Apparently the conclusion to be reached is that any instructional procedure is effective which stimulates the interest of the student and produces desirable activity leading to educational accomplishment and intellectual growth. It may be that in many instances the experimental method is superior to a more traditional procedure because its very newness makes an appeal to and stimulates both students and instructor, as is the case in a change of temperature, climate, or scenery. If such be true, the gain may be due in part to the factor of novelty rather than wholly to method itself.

The study habits of students are conditioned very definitely by the type of test and manner of testing employed. This relationship places a real responsibility upon the teacher in terms of a wise choice of learning objectives, instructional materials, measuring instruments, and testing procedures. New-type objective tests, while possessing certain inherent values, have quite definite limitations and fail to measure certain powers represented in problem and essay tests and in comprehensive or term papers. Frequent testing, analysis of errors and difficulties, and appro-

priate remedial work are effective, although the higher institution must decide to what extent it is responsible for doing "hospital" work covering the elementary- and secondary-school areas of instruction and how permanent such gains are.

The reviewer is impressed by the fact that the majority of the investigators represented in the sections on instructional and measurement procedures have been more than ordinarily careful in equating experimental and control groups, in controlling variable factors, and in formulating guarded generalizations. The fact that many of these workers are teachers of psychology and education, making studies in their own fields of instruction, may have been a major factor in effecting carefully set up experiments. Such investigations are a sharp contrast in terms of scientific method to the subjective questionnaire studies summarized in the first section dealing with student interests and preferences. Of course, the investigational attitude and procedure commended above are much to be desired, especially when experimenting with college classes where so many variable factors in terms of students, teachers, instructional methods, environmental factors on and off the campus, study habits, etc., must be considered. However, by no means all of the experimenters paired students in the experimental and control groups, reversed the groups, calculated the statistical significance of difference in gains, or controlled variable factors adequately. In some of the studies the numbers are too small to provide a basis for generalization.

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